STUDIES IN PSYCHOLOGY

NEET

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THE M. E. BOGARTE BOOK COMPANY
Publishers
1914

PREFACE

These studies in psychology are intended primarily for use in the author's own classes. As the title implies they are in no sense complete. Every teacher of psychology has doubtless felt the need of having some of the essential truths of psychology presented in a teachable form. It is the hope of supplying this need in the writer's own classes that prompts to the present little volume.

A second thought is to give students a general idea of the organization of psychology, and a comprehension of its organizing principle to the end that an intensive study of any particular aspect of the subject may be seen in its proper relation to the science as a whole.

An attempt has been made to analyze knowing into its stages of development in order to reveal the function of analysis and synthesis in the organization of the various truths which make up the subject of psychology.

G. W. N.

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CHAPTER I.

Nature, Subject-Matter and Method of Psychology.

The Meaning of Science.—Every one who has lived very long among people has some knowledge of plant life, of animal life and of the mind. This knowledge he has picked up here and there by experience; by his own experience and by hearsay from others. An examination of this knowledge shows that it exists in bits, scraps and fragments; that it consists of truth mixed with error; that is, it is not very accurate; and that it is not very extensive, and so not complete. Such knowledge, unsystematic, mixed with error, and incomplete is called *common,* or *ordinary,* knowledge. Knowledge which is *systematic* and *accurate* may be developed from common knowledge by experiment, observation and thinking; that is, scientific knowledge may be developed from common knowledge by experiment, observation and thinking. Such knowledge is science, and the following is the formal definition of it:

Science is systematic and accurate knowledge which results from common knowledge. It appears that science is a product of the mind. It results from the mind's

activity. It is a mental thing and has no existence outside of the mind.

It is a mistake to think, for instance, that botany as a science has existed as long as plant life has existed. Botany has existed only since humanity has learned the truths of plant life, has made them into a system, accurate and more or less complete. Plant life is thus many, many years older than botany.

Science is not only the product of one mind but, as we know it, it is the product of many minds, a sort of accumulated product of the mind of humanity.

The Presupposition of Science.—Science is based upon the presupposition that the human *mind acts uniformly;* that is, that under the same conditions, one person's mind acts in general as other persons' minds act; also, that one person's mind acts at one time in general as it acts at other times under the same conditions. If such were not the case we would seem to live in a world of chaos in which no order of any kind could be found.

Illustration.—When ten persons look at snow it appears white to each one; also, if one person looks at snow ten different times, it looks white to him each time. That is to say, the mind acts uniformly to this stimulus, and only this enables us to establish the truth that snow is white. If to one it appeared white; to a second, green; to a third one red, and so on, or to one at one time, white; a second time, green, a third time red, and so on, the truth that snow is white could never be established. And this would be because the mind did not act uniformly.

Mental Phenomena.—If one will turn his mind in-

ward and notice what his own mind does, about the first thing which he will discover is that his mind changes. Now he finds his mind thinking, for instance about grammar, and at another time he finds his mind thinking about history; now, about religion, at another time, about politics; now about music, at another time, about poetry. At one time he finds his mind happy; at another time he finds his mind sad. The only way one can think of *his mind's being in these different conditions at different times* is that his mind changes. One knows his mind changes, if he can know anything and there is nothing which one can know better than that his mind changes. Indeed, if one studies carefully enough, he will discover that there is nothing else which one can know quite so well as that his mind changes. These changes of the mind psychologists call *mental phenomena*. A change is a phenomenon, and a mental change is a mental phenomenon. Other terms frequently used interchangeably with phenomenon are *activity* and *experience*. We thus reach the following statement:

A mental phenomenon is a mental change, or activity, of any kind.

The term, phenomenon, has a first and a second meaning. The first meaning is the meaning explained above. The second meaning is the popular meaning. The popular meaning is that a phenomenon is something marvelous, startling and unusual.

Physical Phenomena.—Any physical thing is a thing which occupies space, such as wood, a book, a horse, or one's body. Or a more fundamental way of

thinking of it is, a physical thing is anything which makes possible sensations of resistance; as, a stone, water, ice, iron, etc. If one observes physical things he soon discovers that they change. He can know that physical things change as well as he can know anything except that his mind changes. That his mind changes he knows best of all things. It is the one thing which can not be disproved to him.

That which enables one to know that physical things change is that they are known to be in different positions and conditions at different times, and the only explanation for this is that they change.

The human body occupies space, so is a physical thing. It is observed in different conditions and positions at different times, so is known to change. These changes of the body are physical changes, or *physical phenomena.*

A truth of a good deal of importance in psychology about mental phenomena is that all mental phenomena are accompanied by physical phenomena. Sometimes the physical phenomena seem to precede the mental phenomena, and sometimes the mental seem to precede the physical, and sometimes they seem to be simultaneous. But, in any case, so far as is known, there is never a mental phenomenon but there is in some way connected with it a physical phenomenon. They are said to be parallel, or they are said to correspond; that is they are corresponding mental and physical phenomena.

No one whose opinion would carry any influence among scientists would claim to know ultimately what

the mind is, nor can any one study the mind directly. But no one knows ultimately what electricity is; no one knows what light is ultimately, nor what gravitation is. We do know, though, how they act or change; that is, we know their phenomena and such knowledge is very valuable to us. We need not be discouraged that we cannot know or study the mind directly, for we can study and know its phenomena and that is as much as we can study and know of anything.

The science which deals with the phenomena of the mind and the parallel, or corresponding phenomena of some part or parts of the body is psychology.

Every science deals predominantly with general truths or laws; that is, truths which are true of many cases. Psychology deals essentially with the laws of mental and physical phenomena, truths which are true of many minds. This when put in the form of a definition is as follows:

Psychology is the science which treats of the laws of mental phenomena together with their corresponding physical phenomena.

Psychology is sometimes defined as *the science of the mind.* While this definition is in a general way true, it is not very helpful. It does not show specifically what the subject is, and rather implies that the mind may be studied directly, which is not the case. The two objections to the definition are (1) it is too general, and (2) it is misleading.

The word, psychology, is derived from the two Greek words, *psyche,* meaning *mind,* or *soul,* and *logos,*

meaning *thought* or *knowledge.* Thus literally psychology is *knowledge of soul or mind.*

The terms, *mind, soul* and *spirit* are used interchangeably by psychologists. Popularly there may be some distinctions in the meanings of these terms and theologians may sometimes make distinctions in their meaning, but such distinctions are not observed in psychology.

Subject-Matter of Psychology.—In the mastery of any branch of science various points of truth must be studied and learned. These truths are usually called facts. Also in mastering any science the connections, or relations, among the facts in the science must be studied and learned. That is to say, in the mastery of any science or branch of science the *facts* and their *relations* must be learned. These facts and relations constitute the subject-matter of any science or subject. And thus the following statements of subject-matter are reached:

A subject-matter of any subject is the facts and relations to be learned in that subject.

A subject-matter is the material of study in any subject.

In the subject-matter of psychology there are in general two points to be found, as follows:

1. Mental phenomena.
2. Corresponding physical phenomena.

In physiology, physical phenomena are studied as well as in psychology. But physiology is not psychology. Not so many physical phenomena are studied in psychology as in physiology. For instance, circulation,

respiration, and digestion are studied carefully in physiology, but they are hardly studied at all in psychology.

And again the physical phenomena are studied in psychology in different connections from what they are studied in, in physiology. In psychology the physical phenomena are studied in connection with mental phenomena, in so far as they affect and in turn are affected by the mental phenomena. In physiology physical phenomena are studied in relation to organic structure in the economy of the life of the individual and species.

In short in psychology we study physical phenomena in order to understand psychology; in physiology, in order to understand physiology.

The Methods of Psychology.—The question in this connection is, *In what manner may the mind study psychology?* That is to say, how may the mind learn, classify and explain the facts of psychology?

There are in general the four following methods of studying psychology worthy of consideration:

1. The Introspective method.
2. The Experimental method.
3. The Comparative method.
4. The Objective method.

The Introspective Method.—The introspective method is the most fundamental method of psychology and is the process of studying psychology by means of introspection. The term, introspection, comes from *intro,* meaning *within* and *spicere,* meaning *to look.* The *ion* in the word signifies *the act of.* Introspection thus is literally the act of looking within.

We learn the physical phenomena around us in the world through our senses; through sight, hearing, touch, taste, etc. We thus learn that objects move, lightning, thunder, the fragrance of the rose and the aroma of the fruit. But we can not learn the phenomena of the mind in this way. These must be learned by having the mind to look into itself. We can turn our minds in upon themselves and have them learn their own phenomena. We can study our wishes, our hopes, our motives, our thoughts and our feelings. The process of thus looking within with the mind's eye is introspection. And thus the following formal statement for it is reached:

Introspection is the process by which the mind directly learns its own phenomena.

Introspection is also called *internal perception.*

Difficulties of Introspection.—There are two difficulties for the beginner in psychology in studying by the introspective method.

1. It is hard for those who have been used to studying objects learned through the senses to turn their minds to intangible, spiritual things and study them.

2. If one turns his mind upon a mental phenomenon, a thought or a feeling, to study it, it soon disappears and he has only the memory of it to study.

The things in our minds which we know through introspection are objects just as truly as the things we touch, see, hear, etc. But so accustomed do we become to thinking of only the things which we can know through our senses as objects that it is difficult at first

for us to see that mental phenomena are objects, also. So since it is difficult to think of mental phenomena at all, it is of course much more difficult to observe, learn, classify and explain them *accurately.*

It is one thing to have the idea of a tree or the feeling of sorrow, but an entirely different thing to study it. Soon after the mind is turned in to study its ideas or feelings they disappear and only the memory of them remains to be examined. They, therefore, get away almost before one gets a good look at them.

But though the introspective method does have its two difficulties, it is entirely necessary to the study of psychology. Without introspection no one could ever be made to understand mental phenomena. No one can understand anger or pain unless he himself has been angry or in pain and he can know his own anger or pain only through introspection.

Psychology therefore *must* be studied by the introspective method.

The Experimental Method.—We can experiment with plants directly in the study of botany; with animals directly in the study of zoology; with chemicals in the study of chemistry or with matter directly in the study of physics, but not with mental phenomena directly in the study of psychology. Yet there is such a thing as the experimental method of studying psychology. We can experiment with the mind indirectly by experimenting with the body, the connection between them being so close, that producing certain bodily conditions induces certain mental conditions; also, producing certain men-

tal conditions induces certain bodily conditions. These connections of the mind with the body, that is, the mind's connections with the nervous system, eyes, ears, muscles, etc. can be experimented with, and thus mental phenomena changed and studied.

"While experiment is only a means of increasing the accuracy of observation and introspection, it has through its wide application made possible important advances in nearly every field of psychology. To its great benefit psychology has become an experimental science."

The study of the mind in connection with the body and the outside world by the experimental method gives rise to Physiological Psychology and Psychophysics.

The study of mental phenomena wholly by the introspective method gives rise to Introspective Psychology; that is, psychology so far as it can be learned through introspection.

The Comparative Method.—Psychology deals with any kind of mental phenomena, but it predominantly deals with the normal adult human mind. Help however comes to the student of psychology from comparing the phenomena of the normal adult human mind with phenomena of other minds. The phenomena of the normal adult mind may be compared with the phenomena of the minds of the following:

1. Lower animals.
2. Children in various stages of development.
3. Persons with defective or disordered minds.

The study of psychology through such comparing is

by the comparative method, and gives rise to Comparative Psychology, which is divided into (1) Animal Psychology; (2) Child Psychology, and (3) Abnormal Psychology.

"Those phases of psychology which touch particularly upon the phenomena of development, whether racial or individual, are spoken of as genetic psychology."

The Objective Method.—The mind by its activities produces results in the outside world. These are called objective results. The student can study these objective results of the mind and learn much about it in a way similar to his learning much about electricity by studying the results it produces. These objective results are fixed, certain and definite signs to us of the way the mind works. Some of these results are said to be:

1. Language and science.
2. Institutions of civilization.
3. Artistic creations.
4. Philosophy and religion.

Studying mental phenomena by means of these objective manifestations is by the *objective method.*

Necessity of Introspection.—It matters not by what method we study mental phenomena we are able to understand them only by referring them to our own mental experiences and this we can do only by introspection. The student of psychology can make no progress whatever in its study without introspection. No one who had never experienced a sensation could be made to understand what a sensation is. The man who had always

been blind thought scarlet must resemble the sound of a trumpet.

The introspective method of psychology is thus the most fundamental method, and introspective psychology is the most fundamental kind of psychology.

The Nature of the Mind.—The persistent question always asked the student of psychology either by himself or by some one else and never very satisfactorily answered is *What is the mind?* It is popular to say that this question can not be answered, discuss why it can not be answered and let it go at that. However, this question is no more unanswerable than the questions, What is electricity? or What is matter? And there is no help in the popular evasion from trying to answer it.

The writer has studied every reason which he has had opportunity to study in support of the contention that the mind can not be defined, and not one seems good. To the author it seems that a definition for the mind may be formed which will not violate any law of logical definition; at any rate, not more than the generally accepted definition of a triangle or of a noun violates the laws of logical definition.

Every student who thinks soon learns that the most persistent thing in the world in which he lives is *force* or *energy;* that is, that which will do work. Force does all the work done in the world of any kind whatever. Force working in various ways which the mind can in any way know we call various things. Force manifests itself in one way and it is called electricity; in another way and it is called heat; in another way and it is called

gravitation; in another way and it is called a tree; in another way and it is called a mullen stalk; in another way and it is called a horse; in another way and it is called a star, and in another way and it is called *mind.* But the form in which the force which we call the mind manifests itself is consciousness. Something is known of consciousness by every one who studies psychology. This knowledge is obtained by comparing consciousness with unconsciousness as manifested in self and in others.

From the above expressed thought the following definition of mind is reached:

The mind is that force which manifests itself in the phenomena of consciousness.

It is not supposed this definition will be fully appreciated by the student who is a beginner in psychology nor by those who are through prejudice antagonistic to thinking of mind as force. But it gives some definiteness to the idea of what mind is, and it is believed that further study of psychology will contribute to the appreciation of the view, and to the realization of the help in the definition.

Read the following:

1. Angell's Psychology, pp. 1 to 7.
2. Pillsbury's Essentials of Psychology, pp. 1 to 10.
3. Dewey's Psychology, pp. 6 to 13.

CHAPTER II.

The Units of Investigation.

Meaning of Unit of Investigation.—The subject of psychology is a science, and has resulted from the fact that the human mind is dissatisfied with common, or ordinary, knowledge and abhors vagueness. In its effort to develop science from ordinary knowledge it begins by stripping away from the subject of study all irrelevant, accidental and occasional facts, seeking the elemental, simple and persistent. In this process it reaches the most elementary, simplest and persistent form of the subject-matter, and this is the *unit of investigation.* The following is the formal statement for it:

The unit of investigation in any science is the simplest, most elementary, and most persistent form of its subject-matter. That is to say, it is the simplest, most elementary, and most persistent whole thing with which the science deals.

Each science has its unit of investigation. The chemist knows that his science is primarily concerned with the element: namely, *oxygen, hydrogen, carbon, calcium, sodium, chlorine, nitrogen, etc.* He studies their number, qualities, atomic weights, combinations and products. The *element* thus is the unit of investigation in chemistry.

The botanist has found that his unit of investigation

is the *organic vegetable cell.* He studies its structure, development, combinations and products.

The zoologist has found that his unit of investigation is the *organic animal cell.* He studies its structure, development, combinations and products.

The science of psychology differs somewhat from other sciences with regard to its unit of investigation. Other sciences have but one unit, psychology has two. This is because of the distinct divisions in the subject-matter of psychology: first, *the mental phenomena,* and secondly, *the corresponding physical phenomena.*

The unit of investigation in the study of mental phenomena is the *sensation.* The unit of investigation in the study of physical phenomena is the *nerve cell.*

How the Unit May Be Studied.—The psychologist may study his unit of investigation in psychology in four ways.

His first task is to observe it so that he may know what it is; that is, that he may know its nature; that he may identify it so that he may be able to think about it in some definite way.

His second task is to find out how it behaves itself; how it acts; what its processes are when subjected to a variety of stimuli under various conditions.

His third task is to find out what new products or combinations are brought into being as a result of the activities or processes of the unit of investigation.

The psychologist's fourth task is to discover, formulate, state and learn the laws and principles governing the activities of both the sensation and nerve cell.

The Nerve Cell.—The nerve cell is a small body of nucleated grayish white matter, nervous matter, including any thread-like extensions reaching from it. Both central body and the thread-like extensions are parts of the nerve cell; that is, when there are extensions. Some undeveloped cells have no extensions. The extensions are of the same kind of material as the central body and are continuous with it. It is sometimes thought that just the central body is the nerve cell, and that the extensions from it are not parts of the cell. But this is wrong. It takes both the central body and the extensions to make the nerve cell. Nerve cells consisting thus of the central body and the extensions are called *neurones* by students of the nervous system.

Forms of Neurones.—Neurones are of various forms. The central body may be *spherical, cylindrical, pyramidal,* or *caudate,* and all are more or less irregular. All neurones of course have the thread-like extensions. There are mere germ cells which have no extensions from them. They are, so to speak, undeveloped, or baby, cells. They are called *neuroblasts.*

Material of Nerve Cells.—Nerve cells are composed of a granular, viscid substance usually called *protoplasm.* Protoplasm is a living substance. Vitality is one of its necessary characteristics. There is no such thing as dead protoplasm. Its exact chemical composition is unknown, though it is known to be complex to a high degree. Its main characteristics are *vitality, absorption, secretion,* and *excretion.* That is to say, it is

living, it takes outside substances into itself, it gives out useful juices, and throws off waste products.

Nerve Fibers.—Nerve fibers are parts of nerve cells, the extensions, or prolongations, leading off from the central bodies. They are too small to be seen with the naked eye, but vary much in both diameter and length. Some are as large as one twelve hundredth of an inch in diameter, and some are no larger than one one hundred thousandth of an inch in diameter. They vary in size between these two extremes. They have a branching structure and vary in length from a part of an inch to several feet.

There are in general two kinds of nerve fibers: those which carry impulses toward nerve centers and those which carry impulses away from nerve centers. Those of the first kind are called *afferent* nerve fibers and those of the second kind *efferent* nerve fibers.

The derivation of these words helps in remembering their meaning. Afferent is from *ad* meaning *to,* and *ferre, to carry.* Afferent nerve fibers are thus *carrying to* nerve fibers. Efferent is from *ex* meaning *from,* and *ferre, to carry.* Efferent nerve fibers are thus *carrying from* nerve fibers.

Sensory and *motor* are terms which mean nearly the same as afferent and efferent when applied to nerve fibers, but not quite the same. Sensory and motor are not quite as broad terms as afferent and efferent. Nerve fibers which carry impulses to nerve centers which do not result in consciousness are af-

ferent nerve fibers, but not sensory. To be sensory the fibers must carry impulses which result in consciousness.

The fibers carrying impulses from the iris of the eye to the brain are afferent, but not sensory.

Nerve fibers carrying impulses from their nerve centers which do not result in muscular action are efferent, but not motor. Such are the fibers carrying impulses from centers to the liver, resulting in the secretion of the bile.

The function of nerve fibers is to carry impulses *to unify the action* of the nervous system. By means of the nerve fibers thus the touch corpuscles in the toes are in communication with the nerve centers in the highest part of the brain.

Number of Nerve Cells.—The number of nerve cells in the human body is so great that one can form no adequate idea of them. It is estimated that there are as many as ten thousand millions in the brain and spinal cord. At any rate it is certain that every one has many millions which remain unused and so never develop.

"Our picture of the nervous system is of a mass of ten thousand millions or so of these minute organisms enclosed within a bony case, the skull and spinal column."

It is well known that cells increase in number by cell division. Nerve cells increase in number in this way early in the life of the human being, but this increase ceases before birth. There is no increase in the number of nerve cells in the human body after birth. Not one of us has a nerve cell more than he had when

he was born. Some of us may have fewer, but none has more.

Connections among Nerve Cells.—Contrary to popular belief, no two nerve cells in the human body have a continuous nervous connection. Each nerve cell is a distinct and separate thing. There is no extension from any nerve cell which is continuous with any extension from any other nerve cell. Each neurone is thus anatomically independent. No connection of *continuity* exists between the neurones.

How then are nerve cells connected? Very much in the same way as the branches of two trees growing side by side are connected, or in the same way as the roots of an elm tree are connected with the roots of an oak growing adjacent. This connection is a connection of contact. Neurones thus have connections of *contact,* but not connections of *continuity.*

Classes of Neurones.—The classes of neurones are (1) sensory; (2) motor, (3) associating. "The sensory are receiving neurones; the motor send impressions out to the muscles, while the associating neurones serve to bring sensory and motor neurones into connection. As the sensory neurones always lead toward the center, they are sometimes called centripetal or afferent, and for a similar reason the motor neurones are the centrifugal or efferent elements." The associating neurones are in a way located between the sensory and motor neurones furnishing pathways for impulses between them.

Axones and Dendrons.—It has previously been seen

that developed nerve cells consist partly of extensions, or prolongations, from the central body.

"These are of two kinds, (1) the *axone,* a fiber having the quality of conductivity and becoming what we have called the axis cylinder of a simple nerve, or nerve fiber; (2) the *dendron,* which divides into finer branches or rootlets, called *dendrites.* Their functions are somewhat uncertain, including possibly that of nutrition in the service of the cell body, but probably that of conductivity also."

"*Axones.*—The axones have a branching structure and vary greatly in length, from a fraction of an inch up to two or three feet, according to location and use. They often branch greatly, throwing off side branches called laterals, which branch again in turn. They usually terminate in little tufts resembling the fingers of a hand, or the rootlets of a plant, and known as the arborization of the axone. The arborization of one axone may, in appearance, clasp or encompass the cell body of another neurone, or the arborization of one axone may interlace with the dendrites of another, and thus effect communication with it by a process thought to be similar to that of electrical induction."

"The neurone consists of a cell body and two sorts of prolongations or processes, the axone or axis cylinder, and the dendrites. The axone is a long hairlike extension that may reach more than half the length of the body. Most nerves in the periphery of the body are groups of axones. The axone ordinarily terminates in a mass of tree-like branches called the end-brush. The

dendrites are similar to the end-brush. They are made up of a number of branches of the cell protoplasm and are usually relatively short. The end-brush of one cell is ordinarily in contact with, or very near, the dendrites of other cells. The two together are sometimes called the arborization of the cells. The points of contact are also designated the synapses."

The Sensation.—It will be remembered that the sensation is the unit of investigation in psychology from the mental phenomena side of the science.

When the end organ of any sensory nerve fiber is stimulated, it arouses a disturbance there; this disturbance extends along the nerve fibers until it reaches the brain and causes a disturbance there which in some way arouses a state of consciousness, if the disturbance is great enough. This state of consciousness is what psychologists call the *sensation.* The awareness of *cold, heat, pressure, color,* and *noise* are states of consciousness which are sensations.

Steps Leading to.—The steps leading to the sensation are partly physical and partly mental, and are as follows:

1. External stimulus.
2. Excitation of outer nerve ending.
3. Transmission of the impulse.
4. Disturbance in the brain.
5. Corresponding disturbance in the mind.
6. The resulting state of consciousness, the *sensation.*

Illustration.—If one should place his hand on a hot

stove, the motion in the particles of the stove—the stimulus—would cause a disturbance in the ends of the nerves in the hand which would extend along the nerve fibers and arouse a disturbance in the brain. Then there would be a corresponding disturbance in the mind from which would result the pain, the state of consciousness—the *sensation.*

Or again, if a gun were fired, the motion in the air would disturb the ends of the nerve fibers in the ears, which disturbance would extend along the nerve fibers and disturb the brain. Then there would be the corresponding disturbance in the mind from which would result the sound, the state of consciousness, the *sensation.*

External Stimulus.—In the two illustrations given above that which disturbs the outer end of the nerve fibers is *motion.* In the first instance it is motion in the particles of the stove and in the second instance it is motion in the air. A careful analysis of various kinds of stimuli will reveal the truth that stimulus is always some kind of motion.

The following from Mr. Dewey helps here: "But numerous as seem the various ways in which external bodies may affect us it is found that these various modes are reducible to one—*motion.* Whether a body is far or near, the only way in which it affects the organism is through motion. The motion may be of the whole mass, as when something hits us; it may be in the inner particles of the thing, as when we taste or smell it; it may be a movement originated by the body and propagated to us through the vibrations of a medium, as when we see

or hear. But some form of motion there must be. An absolutely motionless body would not give rise to any affection of the body such as ultimately results in sensation."

But there may be much motion in the world about us that is not stimulus to us. That motion may be stimulus it must come in contact with some part of the nervous system. A statement for stimulus may be as follows:

Stimulus is any motion which comes into contact with any part of the nervous system.

While stimulus is most frequently external to the body, it is not necessarily so. But it is always as used in this connection external to the mind.

Excitation of Outer Nerve Ending.—Most of the sensory nerves have specialized outer, or peripheral nerve endings. The retina of the eye; the touch corpuscles, the taste buds, etc. are the specialized ends of nerve fibers. Motion coming in contact with these arouses them to a state of motion, disturbance, or vibration. It is this disturbance which is known as the *excitation of the peripheral nerve ending.*

This disturbance gives the impulse a strong initiative and sends it forward with greater force than it would otherwise have.

Transmission of the Impulse.—The disturbance in the peripheral nerve ending extends along the nerve fiber to the nerve center, the brain, and this is known as the *transmission of the impulse.*

But what is the thing which is known as an impulse?

Mr. Dewey says it is an *excess of energy* or a *surplus of force.* A surplus of force always produces motion. So the impulse always produces motion. The nerve fiber may be thought of as made up of very small particles in contact with each other. Stimulus disturbs the end particles which disturb those in contact with them, those disturbing the next and so on. The motion of each particle is produced by the excess of energy transferred to it by motion. In a similar way a nerve center may possess an excess of energy, or force, and motion results. All motion in the world is the result of impulse, or of an excess of energy, or force. The ultimate source of all impulses in so far as our system is concerned is the sun.

As the impulse passes along the nerve fiber a chemical change occurs in addition to the physical change. It seems to be the spreading of the process of oxidation. Mr. Pillsbury says: "Our picture of the propagation of an excitation through a neurone is that it corresponds to the spread of chemical processes through its substance in very much the same way that a spark runs along a train of gunpowder."

Rate of Transmission.—It used to be thought that the impulse was an electrical current passing along the nerve fiber as if the fiber were a wire. But now since the rate of nervous impulse has been measured, it is known to be much too slow for an electrical current. The nervous impulse travels about 110 ft. per second, while an electrical current travels about 186,000 miles per second. The rate of nervous impulse varies, but 110 ft.

per second is perhaps an approximate average. One hundred and ten feet per second is seventy-five miles per hour. So nervous impulses travel along a nerve fiber as fast as a train with a speed of seventy-five miles per hour.

"A sensory nerve conducts a message at the average rate of 111 feet per second. If a man had an arm 111 feet long, one second would elapse from the time his finger was pricked before he felt the pain."

"If a man had an arm sufficiently long to plunge into the sun's vaporous metal, 140 years would roll by before he felt any pain. In other words he would die before he knew his hand was burned. A motor nerve also transmits a command from the brain to the muscle at the rate of 111 feet per second. Suppose an orange tree ninety-three millions of miles in height; and the hand on an arm of that length already lying on a bough one foot from a desired orange. The mind issues a command to grasp the fruit. This order would reach the hand in 140 years, and not until then would the hand grasp the fruit."

Disturbance in Brain.—The impulse reaches the brain and arouses a disturbance there. This disturbance may be small or great depending upon the degree of nervous tension at the time, and the force of the impulse. Sometimes it is almost like dropping a spark into a box of tinder or into a quantity of gunpowder.

Corresponding Mental Disturbance.—Just how the disturbance in the brain occasions a mental disturbance no one knows. But that a corresponding mental disturb-

ance occurs is well known. Introspection shows this and it is also inferred from the observation of others. One knows that a loud noise or a bright light has in close connection with it a mental disturbance. And he knows this in his own life as well as he can know anything whatever. Psychologists say that the exact nature of the connection between the brain disturbance and the corresponding mental disturbance is unaccountable, unthinkable, and incomprehensible.

The State of Consciousness, the Sensation.—The sensation itself is a purely mental thing, not part mental and part physical, and not physical, but always wholly mental. It is consciousness resulting from a mental disturbance corresponding to a disturbance in the brain. It is the state of consciousness resulting from a mental activity. It is a state, or condition, of consciousness. It is fundamental in mental life. A pain from pricking one's finger is a sensation. The odor from smelling a rose is a sensation. The flavor from fruit, the aroma from coffee are sensations.

"Sensations are *in the mind* and not in the various parts of the body. One says that he has a pain in his toe, and so it surely seems to the unsophisticated person; but that is purely a matter of association. The nerve ends are in the toe, but the pain is in the mind only.

We must carefully refrain from speaking of sensations as traveling or being 'carried' from the periphery to the brain. Sensations can not travel. Nerve currents pass from the periphery to the center, but sensations, never. We need, therefore, to distinguish between sensa-

tions, which are psychical, and nerve-impressions, which are physical. They may be thought of as having their point of contact in the cerebrum.''

Definition of Sensation.—The following definition of the sensation is a conclusion from the previous study:

The sensation is a state of consciousness resulting from a mental disturbance corresponding to a brain disturbance caused by some external stimulus.

Importance of the Sensation.—The sensation is the most elementary and most fundamental conscious mental fact. It is the starting point in all mental development. Without it the mind could never start in getting knowledge. Without it there would be no feeling, and the will and its development would have no existence. It is the first conscious step across from the physical to the psychical.

''Sensation is the meeting-place, the point of coincidence of self and nature. It is in the sensation that nature touches the soul in such a way that it becomes itself psychical, and the soul touches nature so as to become itself natural. A sensation is, indeed, the transition of physical into the psychical.''

Read the following:

1. Pillsbury's Essentials of Psychology, pp. 16 to 30.
2. Angells' Psychology, pp. 14 to 24.
3. Dewey's Psychology, pp. 27 to 46.

CHAPTER III.

The Nervous System.

Composition of.—The nervous system is an aggregation of neurones, or nerve cells. As previously seen these cells are anatomically independent. They are connected by contact though that they may work in unity. This fact that they work in unity, organize their work, is all that enables us correctly to call it the *nervous system.*

"We may represent the nervous system most clearly as itself a colony of some eleven thousand million amoeba-like organisms crowded together for the most part within the bony wall of the skull and spinal column with prolongations extending to all parts of the organism. The unit of the nervous system is the neurone. Each is connected with numerous other units, and also at innumerable points stands in close functional relations to the other cells of the body. To understand the action of the nervous system we must learn to know (1) the character of the single unit and (2) the connections the units make with each other and with other parts of the body."

Action of Nervous System.—Since each element of the nervous system is connected with many other elements by contact, they transmit impulses from one to another. The point of contact between any two neurones

by means of their fibers is called the *synapse* (plural, *synapses*). The direction the impulse takes is thought to depend upon the resistance of the nerve endings at the synapses, the impulse following the line of least resistance.

"Since there are evidently many possible lines of transmission, the question naturally arises, what decides which of the many paths shall be followed? The answer is found in a recent theory that the course of the impulse is decided at the point of connection between neurone and neurone, the synapse. The end-brush of the receiving neurone is in contact with the dendrites of several motor neurones. Each of these points of contact, or synapses, has a different resistance. * * * * The lines of discharge depend primarily upon the openness of the synapses. In these lowest reflexes the ease of transmission depends upon the character of the synapses as they are determined in the individual at birth, and thus the responses are prepared in advance of any experience by the nature of the nervous system. When the sensory excitation is weak, only the best developed connections are opened. As the impulse becomes stronger, more and more difficult synapses will be crossed, and the motor discharge will become more and more diffuse."

Centers and Ganglia.—The body of a neurone from which the fibers are prolongations is a nerve center. Several of these bodies in contact or apparently so may also be called a nerve center. Thus there are many centers in the spinal cord and the brain may be regarded as a great nerve center.

Knots or masses of nervous matter are called nervous ganglia. So again the brain is a great nervous ganglion.

Functions.—The functions of the nervous system are in general three, as follows:

1. To transmit impulses.
2. To control impulses.
3. To serve as a storehouse of energy.

Transmission of Impulses.—The human body is called upon in life to unify the action of its various parts. In doing this these parts must communicate one with another. Also, in thinking, one brain area must act in association with other brain areas and so must communicate with each other. The transmission of impulses makes this communication possible. It is thus an exceedingly important function of the nervous system to transmit impulses.

Controlling Impulses.—Impulses do all the work of the body and mind, too. But of themselves they are purely mechanical and uncontrolled. They, unless controlled, produce motion along the lines of least resistance. Now, it is an important function of the nervous system to harness the impulses, so to speak and have them to do some useful work for the body or the mind; that is, to control them. The nervous system does this in all reflex and automatic activity. The nervous system helps to control the impulses in other kinds of activity, too, in any sort of activity of the body or mind whatever. This it is seen is of the highest use to both body and mind.

Store-house of Energy.—It is proper to ask where

the energy or force is which manifests itself in the phenomena of consciousness. And the answer is that it is stored in that part of the nervous system known as the brain. When one thinks that all of the energy for every thought, idea, emotion, sensation, desire, hope, aspiration, determination or perception is stored in the brain he begins to see the importance of this function.

A great amount of energy is stored in the nervous system. It is kept mostly in the nerve centers till occasion calls for its discharge. The muscles are powerless to do work without the discharge of energy to them along the nerve fibers. The more energy there is stored in the nerve centers the greater the nervous tension is, and the more impulses there are. Without the storing up of energy in excess in the nervous system there would be no such thing as self-activity of mind or body.

Divisions of the Nervous System.—For the purpose of help in study, the nervous system may be thought of in two divisions:

1. The central nervous system.
2. The peripheral nervous system.

The Peripheral Nervous System.—The peripheral nervous system consists of all nerve cells, nerves, nerve fibers and nervous ganglia lying outside and around, to some extent, the spinal cord and brain. The nervous mechanism of the eye, of the ear, of the nose, of the mouth, of the skin, and of the heart, lungs and digestive organs constitute in part the peripheral nervous system. The term, *peripheral,* is from two Greek words, meaning

carried around. Thus the peripheral nervous system is, in a sense, carried around the central system.

The peripheral nervous system is of less interest to the student of psychology than the central nervous system, because the mind is less closely connected with it.

The Central Nervous System.—The central nervous system consists of the brain and spinal cord. In the development of the nervous system there is a time when it consists wholly of the spinal cord, and the spinal cord is simply a tube. From this tube of nervous material all the rest of the nervous system is developed, the peripheral system and the brain.

"In the early stages of the embryo the central nervous system is but a groove in the outer layer of the mass. This groove gradually becomes deeper, and the tops of the sides approach until they grow together to form a tube. The different parts of the entire nervous system grow from the different parts of the wall of the tube. The original hollow persists to the adult stage and is modified by the changes in the shape of the wall."

The Spinal Cord.—The spinal cord is a column of soft nervous matter extending from the brain downward in the cavity formed by the bones in the spinal column for about 18 inches in man, where it tapers off into a filament. The diameter of the spinal cord varies at different lengths, but averages on the whole about one-half an inch, or more exactly about as large as one's little finger just in front of the middle knuckle. Running the length of the spinal cord in front is a deep furrow, or cleft, called the *anterior fissure,* and along

the back of the cord is another deep cleft called the *posterior fissure.* The anterior fissure is wider than the posterior fissure, but not quite so deep. These two fissures extend into the cord so far that they almost meet, and thus nearly cut the cord into right and left halves.

Material of the Cord.—If the spinal cord be cut across and one look at the exposed cross section, a grayish appearing substance on the inside will be seen surrounded by a whitish looking substance. In each half the gray matter is somewhat in the form of a crescent with rounded horns, the convex side of the crescent being towards the center and the horns pointing to the front and back.

The white matter of the cord is made up almost wholly of nerve fibers, and appears white from the color of sheathes around the nerve fibers proper, which are of the same material as that of the cell body. The gray matter is made up mainly of the central bodies of neurones, but there are some fibers intermingled with them.

The Spinal Nerves.—From the spinal cord are given off nerves in pairs at intervals along its length. These nerves are called the *spinal nerves,* and there are thirty-one pairs of them. The nerves of each pair spring from the same level, one from the right half and one from the left half of the cord. Each nerve springs from two roots, one from the anterior side and one from the posterior side of its half of the cord. The anterior and posterior roots unite to form one nerve, and then pass from the spinal cavity through openings between the

bones of the spinal column. Afferent nerve fibers form the posterior roots and efferent fibers form the anterior roots, but both are bound up in one nerve. The fibers are distributed to the muscles and skin of the trunk.

Functions of the Spinal Cord.—The spinal cord has two general functions, as follows:

1. The nerve fibers in the cord form the connection between the brain and the peripheral nervous system. Thus sensory impulses are sent to the brain from the sense organs, and motor impulses are sent from the brain to the muscles, and this is its first function.

2. It furnishes a location for nerve centers which control impulses without imposing the task on the brain and mind, and this is its second function.

The Brain.—For our purposes here all of that part of the central nervous system contained in the cranial cavity will be considered the brain. It is the largest nerve center in the body.

Divisions.—In a general way the divisions of the brain are three in number:

1. Medulla Oblongata.
2. Cerebellum.
3. Cerebrum.

In addition to these the Pons Varolii is by some considered a fourth division, but from a psychology point of view it may be considered a part of the medulla oblongata.

The Medulla Oblongata.—The medulla oblongata is continuous with the spinal cord and projects upward into the cranial cavity from it. It is located somewhat

below and almost in front of the cerebellum and nearly centrally below the cerebrum. In structure it is complex, composed of both white and gray matter arranged much as in the spinal cord, but the proportion of gray matter in it is greater than in the cord. It has no convolutions on its surface.

The medulla has at any rate three important functions, as follows:

1. It forms a pathway for all impulses to the hemispheres of the cerebrum from the spinal cord, and from the hemispheres of the cerebrum to the spinal cord.

2. It gives rise to six pairs of the most important nerves in the human body.

3. It contains the nerve centers which control respiration, the beating of the heart, the size of small arteries, swallowing, the secretion of the saliva and other processes.

The Cerebellum.—The cerebellum lies directly behind the medulla oblongata and slightly above it, and directly below the rear portion of the cerebrum. It consists of two masses, a right and left, much larger than the medulla. It has no convolutions on its surface, but its surface is closely folded into parallel ridges. It is made up of white and gray matter, the gray matter on the outside.

Functions.—The functions of the cerebellum are more or less obscure, but so far as known, its main function is the control of the muscles in certain kinds of reflex action. When one is learning to walk or skate or ride a bicycle, he must direct his actions with his mind.

But there comes a time if he keeps practicing, when he no longer must direct these actions with his mind. The actions, some say, have become reflex. But they were not at first reflex. Such actions are called, by some, *acquired reflexes.* Now, the cerebellum is believed to contain the nerve centers for the acquired reflexes employed in walking, running, skating, etc.; that is, in locomotion.

"So little is known about the operations of the cortex of the cerebellum, that it will not be profitable to discuss it. Suffice it to say that the cerebellum has a very rich connection, by means of both sensory and motor neurones, with the cerebrum and the lower brain centers."

The Cerebrum.—The cerebrum occupies the top, front, and upper rear part of the cranial cavity. In fact it seems to occupy almost the whole of the cranial cavity.

In size it is from four-fifths to seven-eighths of the entire brain. Its weight varies in different persons and in the same person at different times in life. Though it is difficult to determine an average brain weight, it perhaps is not far from 53 ounces in adult life. Daniel Webster's brain weighed 53.5 ounces, and Agassiz's, Napoleon's, and Lord Byron's brain about 53 ounces each. A man by the name of Rustan, an ignorant and unknown workman, had a brain weighing 78.3 ounces. Gambetta, a French statesman, "a man of indisputably high genius and ability" had a brain weighing 40.9 ounces. Of the weight of these brains it is to be remembered that the cerebrum was about seven-eighths.

In infancy and childhood the weight of the cere-

brum is not so great, and in old age it is not quite so great as in adult life.

The brains of persons born and reared in cold climates are on the average larger than those born and reared in the warmer climates.

Structure of the Cerebrum.—The cerebrum is divided from back to front by a deep fissure almost into two halves, called *hemispheres,* one being called the right hemisphere, the other the left. This fissure is a continuation apparently of the fissures of the spinal cord, that on the top of the cerebrum being a continuation of the posterior fissure, and that on the under side of the cerebrum being a continuation of the anterior fissure of the spinal cord. This fissure, the *median fissure,* so nearly cuts the cerebrum in two that only a small portion of nervous matter, called the *corpus callosum* is left to connect the two hemispheres. The hemispheres of the cerebrum correspond to each other as the halves of an apple cut in two correspond.

Each hemisphere is divided along its outer side by a second large fissure, which is called the *fissure of Sylvius.* "This fissure is parallel to a line drawn from the end of the nose to the external opening of the ear, and about two inches above it, its middle point being over the ear."

Another way of locating it is that it lies almost directly under a line from the center of the eye socket to a point two inches above the external opening of the ear, this point being over the middle of the fissure in length.

Each hemisphere is also divided by another great fissure, which is called the *fissure of Rolando.* "It arises near the middle and a half inch above the fissure of Sylvius, and extends upward and backward about four inches to the median line separating the two hemispheres."

Lobes of the Cerebrum.—Each hemisphere of the cerebrum is divided on its outer surface into four pretty clearly defined lobes: the *frontal, parietal, occipital,* and *temporal.*

The frontal lobes lie in front of the fissure of Rolando and above the fissure of Sylvius in each hemisphere. They occupy the whole front part of the cranial cavity.

The parietal lobes lie above the fissure of Sylvius and behind the fissure of Rolando. They occupy the whole top portion of the cranial cavity behind the fissure of Rolando.

The occipital lobes lie in the back portion of the cranial cavity below the parietal lobes and above the back portion of the temporal lobes on the sides.

The temporal lobes lie below and behind the fissure of Sylvius along the sides of the cranial cavity.

Convolutions.—Each lobe of the cerebrum is divided into several convolutions by little winding ditches called *sulci* (singular, sulcus). The areas between the sulci are convolutions, and not the ditches as sometimes understood.

Matter of Cerebrum.—The cerebrum is composed of both white and gray nervous matter. The gray matter

is on the outside forming a thin covering over the white matter and extending down into the sulci and fissures. This covering of gray matter is the *cortex*. It is of different thickness in different persons, but is perhaps on an average about one-tenth of an inch thick. In some brains it is one-eighth of an inch thick and in some not more than half so thick. Daniel Webster had a cortex one-sixteenth of an inch thick.

Within, the cerebrum is almost wholly a great mass of white matter consisting of nerve fibers. There are though to some extent ganglia of gray matter scattered among the fibers. The cortex is made up almost wholly of the central bodies of nerve cells.

Functions of Cerebrum.—The functions of the cerebrum are no doubt various, but three important ones stand out:

1. It controls all physical and mental action which usually is said to be under the control of our minds.

2. It contains the centers of all action that can rightly be called mental.

3. It is the storehouse for all energy which manifests itself in conscious phenomena.

The centers of consciousness, attention, association, perception, judgment, reasoning, love, hate, and the will are in the cortex of the cerebral hemispheres.

Read:

1. Angell's Psychology, pp. 10 to 38.
2. Halleck's Psychology, pp. 9 to 29.
3. Pillsbury's Psychology, pp. 16 to 45.

CHAPTER IV.

Activity.

Nature of Activity.—The mind sees objects in one position at one time and in another position at another time. Thus we see a man in Chicago to-day and some time later we see him in New York; we see a bird on the ground now, later we see it in the tree; we see a horse in the field in one place, then in another place. Now we see a train beyond the bridge, then this side the bridge. We say the objects have *moved, changed,* or *acted.* Do we see objects move or do we see them merely in different positions at different times? If the object does not seem to come to rest at different places, we think we see it move, but if we see it one place now, and later see it in another place we say we see it has moved. But we are just as certain of the motion in one case as in the other. The reason it seems to be moving is that the difference in positions is so small and the periods of time between the different positions so small that the eye and mind can not make separate responses to the different positions, but makes a continuous response. So strictly speaking we do not see motion nor do we see the objects move. What we actually see is the object in different positions at different times, and we can account for this only by believing it moves.

Again we see an object in one condition at one time and in a different condition at another time. Thus we

find the road muddy to-day, dusty another day; covered with snow a short time ago, bare now. We find our friends sorrowful now, happy at another time; in a good humor now, angry at another time. We find the stove hot now, cold at another time; new now, old at another time. We find ourselves feeling well now, ill at another time; vivacious now, weary at another time. And we say for this reason that all these things change, act or move. We can account for their being in different conditions at different times in no other way.

It can thus be seen that to the mind change, activity, or motion is but the presupposition of its thinking objects in different positions or conditions at different times.

Inference from the above study gives the following definition for activity:

Activity, to the mind, is the presupposition of its thinking objects in different positions or conditions at different times.

Classes of Activity.—In our studies at present we are concerned with the activity only of the human mind and human body. In considering such activity we do not have to observe very long to see that there are activities of both the mind and body which go on without our intentionally directing them; also, that there are activities of both the mind and the body that we do intentionally direct. These differences among our activities give basis for the following classes:

1. Involuntary activity.
2. Voluntary activity.

Involuntary Activity.—Observation shows us that some of the activity of the body goes on without our intentionally directing it; as, coughing, sneezing, heart-beating, etc.; also, that mental activity occurs of the same kind; as, the wandering of our minds from object to object when we sit down to rest, or at other times. Mental activity thus, as well as physical, is involuntary. From the above study the following definition of involuntary activity is reached:

Involuntary activity is that kind of activity which the mind does not intentionally direct.

Voluntary Activity.—Again observation of our activities reveals to us that such activities as writing, throwing, picking up objects, playing tennis and sewing are physical activities which are intentionally directed. Also that such activities as solving problems in algebra, analyzing sentences in grammar, studying an experiment in science, or interpreting a piece of literature are mental activities which are intentionally directed. Thus again both physical and mental activities are voluntary. From the above study we have the following definition:

Voluntary activity is that kind of activity which the mind intentionally directs.

Classes of Involuntary Activity.—Study shows that there is involuntary activity which is aroused by some external stimulus coming in contact with some peripheral nerve ending, such as jumping because of a noise; also, that there is involuntary activity that seems to originate in some nerve center, such as breathing. These

differences give basis for the following classes of involuntary activity:

1. Reflex activity.
2. Impulsive activity.

Reflex Activity.—If the foot of a sleeper is tickled he will frequently withdraw his foot without any intention of doing so. If a decapitated frog has acid placed upon its leg or flank, it will use one or both feet to brush it away. "If the soles of the feet of a man whose spinal cord is injured any where above the sacral region be tickled, it often happens that his legs will be suddenly drawn up, though the man can not feel the tickling and can not of his own will draw up his legs."

Again a loud noise or sudden motion toward the eyes makes one jump unintentionally.

It should be noticed in all such action first that the action is muscular, or it may be glandular, as the secretion of the tears or the saliva, and, since muscles and glands act only in response to nervous action, also nervous; that is, *neuro-muscular* or *neuro-glandular* action; secondly, that there is always an *external stimulus;* and thirdly, that the action is *uncontrolled by the mind.*

Such action as the action studied above is *reflex action,* and the following is a formal statement for it:

Reflex action is neuro-muscular or neuro-glandular action caused by some external stimulus and uncontrolled by the mind.

Or a second way of putting it is as follows, since it is action not intentionally directed:

Reflex action is involuntary neuro-muscular or neuro-glandular action caused by some external stimulus.

The Process of Reflex Action.—The process of reflex action is as follows: a disturbance is caused in some nerve center by an external stimulus; without being transmitted to the higher nerve centers of intentional control, or before the higher nerve centers of intentional control have time to act, an impulse is sent out and produces activity. The nerve centers turn back, *reflex*, so to speak, the impulse; hence the name reflex activity. The nerve centers which control reflex action are mostly found in the spinal cord, but some are in the brain.

Classes of Reflex Action.—In the case of the man who draws his feet up when they are tickled, there is no consciousness of the stimulus nor of the action; but in the case of the one who jumps because of the loud noise, there is consciousness of both the stimulus and the action. These differences give basis for the following classes of reflex action:

1. Unconscious reflex action.
2. Conscious reflex action.

Illustration.—When the dim rays of light come into the pupil of the eye, they act as a stimulus which causes the muscles of the iris to so act as to enlarge the pupil. Also, when too bright rays come into the pupil of the eye they cause the muscles of the iris to so act that the pupil is made smaller.

The presence of the food in the stomach acts as a stimulus which causes the stomach to blush; and the food in the intestines acts as a stimulus which causes the

liver to secrete the bile. All these are cases of *unconscious reflex action.*

Illustration.—A little thought shows that in coughing and sneezing we are frequently conscious of the stimulus and the action. So coughing and sneezing are frequently good examples of conscious reflex action. We are frequently painfully conscious of both the stimulus and the action and try in vain to prevent the action, or remove the stimulus. Also when we jump because of a loud noise we are conscious of the stimulus and also of the action. Such are good examples of *conscious reflex action.*

Further Classes of Reflex Action.—By observing reflex action from another point of view we see that such instances as coughing, sneezing, and the movements of digestion are reflexes with which we are born. But if one strikes his foot against something and starts to fall, his hands will be thrown out to break the force of the fall, and many movements, in walking, skating, riding a bicycle, which many authors call reflexes, if reflexes, are not those with which we are born. These differences in these activities give basis for the following:

1. Original reflex action.
2. Acquired reflex action.

Original Reflex Action.—It is evident that one is born with many reflexes. In addition to those mentioned above are winking, the secretion of the saliva, the secretion of tears, and the adjusting of the eyes to see objects near and far.

Acquired Reflex Action.—In cases of walking, skat-

ing, etc., it is not very clear that they are reflex action. They are acquired without any doubt, but they seem to be actions that were at one time voluntary, but which have become more or less automatic. A definite external stimulus seems to be lacking. However, they are considered by some authorities as reflex actions, and if there be such action, they are examples of it.

Functions of Reflex Action.—The functions of reflex action are at any rate three, as follows:

1. To carry on the routine work of the body.
2. To carry on the functions of the body when one is unconscious or when consciousness is otherwise engaged.
3. To protect the body in cases which require quicker action than voluntary action.

Impulsive Action.—It is necessary for us to remember that an impulse is an *excess of energy,* or *a surplus of force.* Children often when they are asleep throw their hands, legs, and feet about, also their whole bodies. Such actions are caused by the tension in the nerve centers due to the excess of energy stored there. This tension probably is due to the effect of the blood on the nerve centers. At any rate there is no doubt that the tension exists and when it becomes too great an impulse starts from the nerve center and produces action. Such action is *impulsive action.* Persons who have very much impulsive action are called *nervous persons.* The following statement for impulsive action is reached from the above study:

Impulsive action is that kind of involuntary action

caused merely by an impulse arising from the tension in the nerve center.

Kinds of Impulsive Action.—Some cases of impulsive action are purposeless; that is, they are not put forth to do any useful work. Of such impulsive action, the child's throwing itself about in its sleep, and protruding and chewing its tongue, when learning to write, are examples.

Again in such impulsive action as breathing and heartbeating the action is purposive; that is, is put forth to do some useful work. These differences give basis for dividing impulsive action into:

1. Purposeless impulsive action.

2. Purposive impulsive action, or automatic action.

Automatic action is impulsive action which serves the body some useful purpose.

Kinds of Voluntary Action.—Voluntary action is of two kinds:

1. Unreflective.

2. Reflective, or deliberative.

First, one frequently acts without reflection. Thus some one strikes a person and he strikes back at once. The bell rings and one starts to the class. One sees somebody fall and stops to help him up. One claps his hands when he has listened to a piece of music. Such actions are unreflective.

Secondly, one contemplates taking a journey, or buying a farm, or going into some kind of business and

often thinks a long time on such action. All such actions are reflective or deliberate.

Read:

1. Angell's Psychology, pp. 48-49; 283-293.

CHAPTER V.

Mind and Body.

Connection of Mind and Body.—Everyone agrees that there is a close connection between the mind and the body. But perhaps at present not more of this connection is known than the mere beginning, the a, b, c, of it, so to speak. All know that prolonged physical work will produce mental fatigue, and that prolonged mental work will produce physical fatigue. Bodily injuries produce pain, but in case of mental excitement frequently there is no pain until the excitement is over. Good news or bad news may remove hunger, and persons have been scared to death, or have been frightened into illness. Embarrassment makes the mouth dry and anger may make it bitter.

All these and many other facts indicate a general intimate connection between mind and body.

Effect of Suggestion.—If it is suggested to one that a certain bodily condition exists, or will exist, this suggestion has much influence in producing such physical condition. Headaches, toothaches, and other physical afflictions have been removed by suggestion.

"A house surgeon in a French hospital experimented with one hundred patients, giving them sugared water. And then, with a great show of fear, he pretended that he had made a mistake and had given them an

emetic instead of the proper medicine. Dr. Tuke says: 'The result may easily be anticipated by those who can estimate the influence of the imagination. No fewer than eighty—four-fifths—were unmistakably sick'."

Most remarkable changes of the body, even to the blistering of the skin, the change in the blood supply to parts of the body, the disturbance of digestion and even death may result from suggestion, if various good authorities are to be believed.

Suggestion here means leading the person to believe that the bodily condition either exists or will exist.

The influence of the mind over the body is known to be very powerful.

Opinion of the Greeks.—Just what part of the body the mind is most closely connected with has for more than two thousand years been a subject of study. The Greeks studied this question and reached various conclusions. Plato believed that the brain is the seat of the mind, but Aristotle, the greatest Greek philosopher, rejected this idea. He and other Greeks placed the mind in various parts of the body.

Brain Injury and Consciousness.—The connection between consciousness and the brain is closer than between consciousness and any other part of the body. A blow on the head produces unconsciousness by producing concussion of the brain. A blow on almost any other part of the body produces only pain. A blow upon the heart might produce unconsciousness, but that is because it would disturb the blood supply to the brain. Since

consciousness is a mental thing, a state of mind, this indicates connection between the brain and the mind.

Nerves and Consciousness.—It is because of the connection by nerve fibers between any part of the body that may be stimulated and the brain that the mind knows of any touch or injury. Let the nerve fibers be cut so that they can not transmit impulses to the brain, and the mind neither knows of the injury nor feels any pain from any wounded part of the body. This is because the brain is disconnected from the injured part. But knowing and feeling are activities of the mind. So brain work is necessary to mental work and this again is evidence that the brain is the organ of the mind.

The Blood, the Brain and the Mind.—Any disturbance of the blood supply to the brain always produces a corresponding disturbance in the mind. There is a case on record of a man who had an unusually fine memory. He had a spell of sickness which left him with enfeebled heart action for more than a year. During this time his memory was almost gone. When he recovered his normal heart action, his splendid memory returned. The cause of the poor memory was the poor blood supply to the brain.

Again it is common observation that bad air makes attention and learning difficult and many times impossible. This is because of the mental condition induced by blood improperly aerated acting on the brain.

Mental action causes an increase in the temperature of the brain. Dr. Lombard, a noted investigator says: "Every cause that attracts the attention—a noise, or the

sight of some person or other object—produces elevation of temperature. An elevation of temperature also occurs under the influence of an emotion, or during an interesting reading aloud.''

''While a woman was being subjected to a test of this sort, from no apparent cause her temperature suddenly arose. The explanation was that she had at that moment caught sight of a skull in the room.''

''From experiments on animals, we learn that the active use of their senses causes a rise in cerebral temperature. A German investigator found that when he presented something not good to eat to the nostrils of a dog, the momentary sniff was accompanied by a slight rise in temperature. When a package containing a piece of meat was offered, the temperature was higher, because of more lively emotional interest.''

An italian investigator by the name of Mosso devised a table balanced so nicely that a man might lie on it without disturbing its equilibrium. By introducing some interesting subject that quickened the action of the mind, he found that thus the balance was almost immediately destroyed. ''A sudden noise, an interesting thought, anything that increased the activity of consciousness, would cause the head end of the table to sink down as quickly as if a weight had been placed upon it.'' This phenomenon is thought to mean that there is either a greater amount of blood in the brain or that a greater amount of blood flows through the brain, when mental activity is increased.

Localization of Functions.—The brain has its work

systematized to a greater or less degree. There are specific areas for specific functions. Not all parts take part in any work the brain has to do. Brain functions and brain areas are differentiated, or there is a division of labor in the brain.

The Motor Zone.—This is an area of the brain lying on the front side of the fissure of Rolando, according to most recent investigations, in the frontal lobes. It is that part of the brain concerned in sending out commands to move various parts of the body.

"So definitely has this area been mapped out, that it is possible to find, for the purpose of a surgical operation, so small a center as that which moves the vocal cords, directs a thumb, or winks an eye."

Sensory Brain Areas.—These areas are those which receive impulses from the sense-organs. The known ones are located as follows:

1. The centers of sight in the occipital lobes of the cerebrum.

2. The centers of hearing in the upper part of the temporal lobes of the cerebrum, just below the fissure of Sylvius.

3. The centers of taste and smell on the inner surface of the temporal lobes at the front just below the front portion of the fissure of Sylvius.

4. The centers of touch in the parietal lobes.

The Center of Speech, or Broca.—This center is the source of much interest. It is situated in the lower part of the frontal lobes just in front of the fissure of Rolando, and just above the front portion of the fissure of

Sylvius. It is a center not much larger than a pea. There is one in each hemisphere, but under ordinary conditions only one functions. Recent investigators say that if a person be right-handed, the center of Broca is invariably found in the left frontal lobe, but if the person be left-handed the center is invariably found in the right frontal lobe; also, that an attempt to change a left-handed child to a right-handed one frequently interferes with speech, sometimes producing bad cases of stammering.

This center seems to control the muscles of the vocal cords, tongue, etc. used in speaking. The following quotation sums up pretty well recent thought on this question:

"We know to a certainty that the muscles of the right side of the body are controlled by brain elements in the left side of the cranium, while the muscles of the left side of the body are controlled by brain elements in the right side of the cranium. So accurately have post mortems and surgical operations following attacks of paralysis disclosed the seat of the trouble causing the paralysis, that by studying the organs paralyzed we can tell with almost absolute certainty just where in the brain the blood clot may be found in any given case. If a man gets a blow directly on the top of the head of sufficient force, his legs will be, for the time being at least, paralyzed, so that if a man is stricken with paralysis of the legs we know that the blood clot will be found in the top region of the brain. By the same test we know if an arm is paralyzed the blood clot

lies farther down toward the region of the ear. Still farther down we find the areas that successively control the mouth, the lips, throat and tongue. If the paralysis is on the right side of the body we know that the blood clot is in the left brain, whatever the region may be. Conversely if the paralysis is on the left side of the body the blood clot will be found in the right brain.

From the foregoing facts it seems that the motor forces of the body originate in either or both sides of the brain. But not so the intellectual faculties. Just below the region of the brain that controls the tongue we find what is known as Broca's convolution, which is not much larger than a pea. It has been demonstrated that this little body is the sole center of articulate speech. It seems to control directly the muscles of the tongue, mouth, throat and lips. Hence an injury to that little organ renders speech more or less impossible. Now there is a close relation existing between speech and gesture, and as that part of the brain which controls the arms and hands lies next to that part of the brain that controls speech, there seems to be good reason for the use of gesture as an aid to speech."

"Now note this fact, that in the right-handed the speech center is always in the left brain, and not in both, while in the left-handed it is always in the right brain. It is true there is a Broca's convolution in both the right and left brain, but only one is used. However, if the convolution on one side is damaged in youth it is possible for the individual slowly to learn to talk. But if the damage occurs in middle life, or after that, speech

is rarely regained, even though the individual seemingly recovers in other respects.''

Association Centers.—The areas in the cerebrum which lie between the different sensory centers and between the different motor centers and between the sensory centers and the motor centers are the *association centers.* They are made up of the association neurones.

Phrenology.—The psychologist is often asked for opinions concerning phrenology. So we will let the following eminent authors speak on the subject:

Dr. William T. Harris says: ''In later times different phases of the mind came to be assigned to different parts of the body. The spleen was supposed to be the seat of hilarity and good spirits; wisdom dwelt in the heart; anger in the gall; love in the liver; vanity in the lungs.''

''Gall, in 1789, gave the first impulse to the widespread movement under the name of phrenology. He was joined by Spurzheim, in 1804, who carried the system to England and the United States, gaining many disciples in both countries while Gall made many influential converts in Paris. Gall mapped out on the skull the locations of mental peculiarities, which he named from their excessive manifestations, organs of murder, theft, cunning, pride, vanity; on the other hand, Spurzheim attempted to systematize the organs into groups, and to name them from their normal manifestations.''

''But, aside from this *a priori* system of psychology based on crude introspection, a serious objection to phrenology is to be found in the fact that the so-called

'organs' are protuberances of the skull, and do not correspond to the natural divisions of the brain. The 'organs' of perception, twelve in all, crowded together behind the eyes are formed by the protrusion of the outer wall of the skull, while the inner table, keeping close to the brain, leaves a 'sinus,' or chasm, between it and the outer. Moreover, the convolutions, which are distinctly marked by well established fissures or furrows (sulci), in no case agree with the 'organs' as mapped out. Some organs are located over fissures; some unite portions of different convolutions. The organ of amativeness belongs to the cerebellum, while that of alimentiveness (another 'propensity') belongs to the cerebrum. Bony processes on the skull for the insertion of muscles are (as in the case of 'combativeness') mistaken for brain protuberances. No account is made of the convolutions in the 'island of Reil', or of those which are found in the median longitudinal fissure which separates the two hemispheres of the brain.''

Dr. Joseph Simms says: ''Phrenologists assert that each organ of a mental faculty occupies a certain position perciptible on the outside of the brain, with a definite area which they have mapped out. They also hold that each of these organs extends to the center of the base of the brain, tapering to it somewhat like a cone, having its base turned toward the outer world. They make no account of the fissures, the intervening sulci and anfractuosities that cut many of these supposed cones, some at right and some at oblique angles. Then the large, long cavities or ventricles intercept and would

hinder many of them from reaching the central, basilar part of the brain. The anatomical structure of the brain thus appears fatal to this theory of the organs.''

''The late Dr. O. W. Holmes, a learned man and experienced physician and professor of anatomy in Harvard University for thirty-five years, says: 'The walls of the head are double, with a great chamber of air between them, over the smallest and most crowded organs. Can you tell me how much money there is in a safe, which also has thick walls, by kneading the knobs with your fingers? So, when a man fumbles about my forehead, and talks about the organs of individuality, size, etc., I trust him as much as I should if he felt over the outside of my strong box, and told me that there was a five-dollar or a ten-dollar bill under this or that rivet. Perhaps there is, only he doesn't know anything about it. We will add that, even if he knows the inward dimensions of the strong box, he could not thence determine the amount of cash deposited in it'.''

These quotations sum up pretty well what scientists think of phrenology. No one who has studied science long enough to make his opinion worth anything believes what it teaches.

Effect of Brain Injury on Mind.—This is shown to some extent in the case of a man named Gage who was tamping a charge of blasting powder in a rock with a pointed iron bar three feet and seven inches long and one and one-quarter inches in diameter, and weighing thirteen and one-half pounds, when the charge suddenly exploded. ''The iron bar, propelled with its pointed end

first, entered at the left angle of the patient's jaw, and passed clear through the top of his head, near the sagital suture in the frontal region, and was picked up at some distance covered with blood and brains. The patient was for a moment stunned, but within an hour after the accident he was able to walk up a long flight of stairs and give the surgeon an intelligible account of the injury he had sustained. His life naturally was for a long time despaired of; but he ultimately recovered and lived twelve and a half years afterward."

"His contractors, who regarded him as the most efficient and capable foreman in their employ before his injury, considered the change in his mind so marked that they could not give him his place again. The equilibrium or balance, so to speak, between his intellectual and animal propensities seems to have been destroyed. He is fitful, irreverent, indulging at times in the grossest profanity, which was not previously his custom, manifesting but little deference to his fellows, impatient of restraint or advice when it conflicted with his desires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans of future operation, which are no sooner arranged than they are abandoned in turn for others more feasible. A child in his intellectual capacity and manifestations, he has the animal passions of a strong man. Previously to his injury, though untrained in schools, he possessed a well balanced mind, and was looked upon by the people who knew him as a shrewd, smart business man, very energetic and persistent in executing all his plans of operation.

In this regard, his mind was radically changed, so decidedly that his friends and acquaintances said he was no longer Gage.''

Aphasia.—Aphasia is the loss of the power of speech, the vocal organs remaining uninjured and the intelligence unimpared. It results from injury to the brain. If the nerve cells in the center of Broca in the frontal lobes of the cerebrum are diseased or injured so they can not function aphasia results from the lack of ability to control the organs of speech.

Or again if the nerve cells in certain places in the temporal lobes are injured or diseased aphasia results from the loss of memory of spoken words. One could not speak his own name or that of any friend or object whatever, nor could he understand what is spoken to him by anyone whatever.

Brain Size and Intelligence.—Contrary to popular opinion there is no direct proportion between the size of the brain and the intelligence of the person. Brains ranging anywhere from forty to seventy ounces may belong to persons of remarkable intellectual power and distinguished ability or to idiots and imbeciles.

Dr. Joseph Simms, an eminent scientist and scholar, studied this subject for more than thirty years in North America, continental Europe, Great Britain, Asia, Africa, and Australia, and is thus capable of speaking with authority concerning it. He says: ''Esquirol's assertion that no size or form of head or brain is incident to idiocy or superior talent is borne out by my observation.''

"Taking, now, the sixty heaviest brains of persons not noted for intellectual greatness, we find the average to be 63.2 ounces. Comparing this with the average of sixty famous men, 51.3 ounces, we find a difference in favor of imbeciles, idiots, criminals and men of ordinary mind of 11.9 ounces."

These and many other studies show that one could never classify men into classes of different degrees of intelligence upon the basis of brain size.

Convolutions and Intellectual Capacity.—"Large and complicated convolutions of the brain with deep sulci have been regarded by some persons as inseparable from superior powers of mind. The supposition is erroneous and groundless. * * * * Squirrels manifest foresight and economy in storing nuts for the winter's use; yet they have no brain convolutions. The cetacea, especially whales, have much larger brains than men, with more numerous and more complex convolutions and deeper sulci; yet their intelligence bears no comparison with that of the human race."

"Idiots often possess as large brains as men distinguished for their intellectual power, and their brains have as deep sulci, and convolutions as fine, as large and as complex. Our table of the common and weak-minded contains a mention of an idiot whose brain weighed fifty-three ounces, or exactly as much as Napoleons, and had fine convolutions and a large frontal lobe, but who could never learn to speak."

"The elephant carries a far larger brain than man, finely formed, broad and high in front, with much more

numerous and complex convolutions and deeper anfractuosities, and yet no intelligent person would for a moment claim that its mind excels or even equals that of man.''

Growth and Development of Brain.—Growth of the brain means increase in weight or in bulk. At birth the brain of the average baby is near three-fourths of a pound in weight or about one-eighth the weight of its body. Its brain grows very rapidly during the first four years and then slowly increases until about fifteen or sixteen when it reaches its full weight. A brain whose maximum is 1,440 grams would weigh at seven years of age 1,350 grams and at four years of age 1,325 grams approximately. After the age of fifteen or sixteen the weight of the brain remains nearly the same till about fifty, from which time on till death it loses in weight, as estimated by some authorities, at the rate of one ounce in ten years.

Brain development means a perfection in the structure of the brain. This consists in the change in the shape and size and prolongations of the cells in the brain. While brain growth goes forward so rapidly brain development goes on very slowly. And when brain development begins and continues rapidly brain growth becomes slower and slower and after a time ceases entirely.

Read:

1. Pillsbury's Essentials of Psychology, pp. 36-42.
2. Angell's Psychology, pp. 27-38.
3. Halleck's Psychology, pp. 16-29.

CHAPTER VI.

Mental Attributes and Consciousness.

Meaning of Attribute.—An attempt to study anything for the purpose of understanding it always consists in seeking out the attributes of that thing, and an object is known just to the degree that its attributes are discovered and learned. All knowledge thus in a general way grows out of the process of discovering and learning the attributes of objects. If one knows all the attributes of an object, he knows all there is to be known about that object. And if he knows all the attributes of any object, he knows a great deal about every object, since any object has connections with all other objects. Thus to know all the attributes there are to know would mean infinite knowledge, the knowledge of everything.

The terms, *characteristic,* and *mark,* are terms used interchangeably with the term, attribute.

Strictly speaking an attribute is indefinable, but the following statement characterizes it:

An attribute is any characteristic of an object which helps the mind in knowing the object.

Illustration. — A certain house is *large, red, new, rectangular, has* four verandas, two chimneys, *surrounded* by a big lawn, *has* two bay windows, and is *situated* on a slope. Each of the italicized words expresses an attribute of the house; that is, it expresses

some mark of the house which helps the mind in knowing it.

Classes of Attributes.—If we observe the attributes of objects very long we soon see that each object possesses some attributes that enable the mind to know it from every thing else. Thus in the sentence, *This* knife *in my hand* is a present from mother, the italicized words express attributes which enable the mind to know the knife from all other things. Again the tower on the east division of the old college building has some attributes which enable the mind to know it from all other things on earth. The same is true of every other object.

And again we can observe that every object in a class has some attributes that belong to every other object in the class. Thus one triangle has just three angles, and so has every other one just three angles. One man has a vertebral column and so has every other man. One dog is a quadruped and so is every other dog. One winter is colder than summer in the temperate zones and so is every other one.

Thus from this viewpoint there are two classes of attributes:

1. Particular.
2. Common.

And the following are definitions for them:

A particular attribute is an attribute which helps the mind to know its object from everything else. In the sentence, Niagara Falls is a grand spectacle, "Niagara" expresses attributes which help the mind in knowing the falls from all other things. Thus "Niagara" expresses

a particular attribute. When we talk about a *particular* object, the term, *particular,* means just those attributes which enable the mind to know the object from all other things. *Individual* is a word which means the same as particular. Thus an *individual* object and a *particular* object mean the same. Each object is a particular object, since each object has some attributes which enable the mind to know it from everything else.

A common attribute is an attribute which belongs alike to each object of a class of objects. Thus *sweetness* is a common attribute of sugar; sourness, of acid; growing feathers, of birds; and having four feet, of horses.

Classes of Common Attributes.—Again we observe that some common attributes belong to every object of the class but do not extend beyond that class; that is, do not belong to any other object besides those of the class. Thus *growing feathers* is an attribute that belongs to every bird of the class birds, but does not belong to any other object except birds; that is, does not extend beyond the class.

There are also some common attributes that belong to every object of a class but also belong to other objects; that is, extend beyond the class. Thus having two feet is a common attribute of birds, but it is an attribute also of man and monkeys.

These differences among common attributes give basis for two classes:

1. *Class common attributes.*
2. *Universal common attributes.*

The following are definitions for them:

A class common attribute is a common attribute which does not extend beyond the objects of a class. Three-angledness is a class common attribute of triangles; growing flowers, a class common attribute of one kind of plants.

A universal common attribute is a common attribute which extends beyond the objects of a single class. Having wings is a universal common attribute of birds. It belongs to all birds, but also belongs to other things besides birds, to butterflies, for instance.

It is quite common for students to make the error of thinking that a universal attribute is one that belongs to everything in the universe. But this is just what it does not mean. There is good reason for thinking that no such attribute exists. The universal attribute is an attribute that connects a class out with other things in the universe. Thus *having wings* connects the class, *birds,* with butterflies, bees, bugs, and other things.

An Attribute of Mind.—A man can do various kinds of work. He can run, skate, cut wood, build houses, etc., but in order to do these various things he must possess various attributes. He must have weight, strength, etc. Thus *weight* and *strength* are attributes of one's body. Without these one could not run, jump, skate, and so on. In an analogous way the mind has attributes. Without these it could not do its work. The following is the formal statement for an attribute of mind:

An attribute of mind is a fundamental characteristic of mind without which mind could not do its work.

Universal Common Attributes of Mind.—The following is a list of the attributes of mind most valuable to study:

1. Consciousness.
2. Attention.
3. Apperception.
4. Self-activity.
5. Iterativeness.
6. Rhythm.

These attributes are as fundamental and necessary to the mind as weight or strength is to the body. They belong to all human minds but they also belong to some of the lower animals. A horse is conscious, can give attention, and is self-active. Thus these six attributes are universal common attributes of the human mind.

Consciousness. — This is the most fundamental attribute of mind. Without consciousness the mind as we think of it could not be studied or known.

One can at the start get a general idea of consciousness by comparing his condition of mind when he is very sound asleep with his condition of mind when he is awake. When he is awake consciousness is showing its influence upon the mind, but when he is sound asleep consciousness is not influencing the mind at all; consciousness is in abeyance.

If one knows, he knows that he knows or knows that he thinks he knows that he knows; that is, he knows his own mental condition. Again if one is asked a question, and he says he does not know the answer to it, it is because he knows the condition of his own mind. If

one is insulted, he feels hurt or angry and he knows that he feels hurt or angry; that is, he knows his own mental condition. If one is thinking about Niagara Falls, he knows that his mind is active; that is, he knows his own mental activities. If one is solving a problem in arithmetic, he knows that his mind is active on arithmetic; that is, he knows his own mental activity. The mind thus knows itself.

What enables the mind thus to know itself; that is, its own conditions and activities? Consciousness. The mind is able to do this because of the attribute of consciousness. Thus we reach the following statement for consciousness:

Consciousness is that attribute of mind by virtue of which the mind knows itself; its own conditions and activities.

Thus by virtue of consciousness the mind is different from anything else known to us. Mind is the only thing that can know itself. Through consciousness the mind knows its own sorrows, pleasures, pains, hopes, aspirations, successes, disappointments, loves, hates, ideals and motives, and it knows it knows these, and knows itself as the knower.

Classes of Consciousness.—If one observes his own consciousness by means of introspection he will see that at some times he seems to be conscious of what is in his own mind. Thus we ask one what he is thinking about and he says he is thinking of his own thinking; that is, of what is, so to speak, passing through his mind. Thus

one thinks of his own motives or intentions. Or he thinks of his own sorrow or depression.

At another time one seems to be conscious of something not in his mind. Thus one seems to be conscious of a friend, a house, a tree, a flower, a dewdrop or an ocean. These differences in consciousness give basis for two classes of consciousness. First, that kind by which we seem to be conscious of some object outside the mind. Secondly, that kind of consciousness by which we seem to be conscious of something in the mind.

1. *Objective consciousness.*
2. *Subjective consciousness.*

The following are the formal statements for them:

Objective consciousness is that kind of consciousness by which the mind seems to be aware of something outside the mind.

Subjective consciousness is that kind of consciousness by which the mind seems to be aware of something within the mind.

Objects of Consciousness.—Observation shows us that we may be conscious of, in general, two kinds of things: first, *physical* things; secondly, *mental* things.

Nature of an Object.—The true idea of an object is frequently not to be found in the minds of those who should have it. In fact many persons have but a restricted idea of an object. It is quite common to find persons who think only those things which occupy space and have weight are objects. To such persons such things as trees, rocks, houses, horses, etc. seem to be objects, but such things as character, honor, beauty,

virtue, wisdom, etc. do not seem to be objects. The view that only those things which possess weight and occupy space are objects is narrow and erroneous.

The derivation of the word, *object,* furnishes a key to the right idea of what an object is. The word is from *ob, against,* and *ject, thrown.* Thus an object is anything which is *thrown against* the mind as a challenge to its activities. That is to say, anything the mind thinks about is an object. The following is the formal definition for an object:

An object is anything about which the mind can think.

Classes of Objects.—Observation shows us that the mind sometimes thinks of such objects as flowers, trees, men, horses, books, and mountains; that is, about objects which *occupy space.*

And again the mind thinks about such objects as honor, virtue, character, purity, whiteness, sweetness, love, hate, sorrow, misfortune and happiness; that is, about objects which *do not occupy space.* This difference in objects about which the mind thinks furnishes basis for two classes of objects: 1. Material. 2. Immaterial.

The following are the formal definitions for them: *A material object is an object which occupies space. An immaterial object is an object which does not occupy space.*

The things which the mind is conscious of are thus both physical and mental. That is to say, the mind is

conscious at some times of material objects and at other times of immaterial objects.

Fields of Consciousness.—If one examines his mind carefully by introspection he will find that at almost any time when he is awake there are many things more or less in one's mind. For instance, one sits in the library reading a book. The content of what he is reading is in his mind, so are various sounds, other persons in the library, the trees which appear through the window, book cases, the touch of his clothing, and so on, perhaps. It is true that most of these are only dimly in the mind, but in the mind all the same. Thus what one has in mind at any one time constitutes a kind of *conscious field.*

Again we observe that most of what we have had in our minds in the past and what we say we know we do not have in mind at any one time. Indeed we have very little of what we know in our consciousness at one time. So there is a great field of what we have known which constitutes a sort of subconscious field. These differences in our minds give grounds for the two classes of conscious fields.

1. The *conscious field.*
2. The *subconscious field.*

The Conscious Field.—The conscious field consists of all that one has in consciousness at any one time, either dimly or clearly. One's conscious life is a succession of these fields. They always have various things in them; that is, they are *complex.* "They contain sensations of our bodies and of the objects around us,

memories of past experiences and thoughts of distant things, feelings of satisfaction and dissatisfaction, desires and aversions, and other emotional conditions, together with determinations of the will, in every variety of permutation and combination.''

The conscious field always has something in it which is clearly in consciousness. This is called the *center,* or *focus* of the conscious field. All of those things in the conscious field which are but dimly in consciousness constitute what is called the *margin* of the conscious field.

The Subconscious Field.—The subconscious field is made up of all that the mind has ever had in consciousness but which it does not have in consciousness at any time. ''At any one moment we are not conscious of a thousandth part of what we know. It is well that such is the case, for when we are studying an object under a microscope, trying to memorize poetry, demonstrating a geometrical proposition, or learning a Latin verb, we should not want all we knew of history and physics, or images of the persons, trees, dogs, birds, or horses, that we remembered, to rush into our minds at the same time. If they did so, our mental confusion would be indescribable.''

Differences in States of Consciousness.—By observation through introspection it may be seen that our conscious states differ in the following respects:

1. They differ in *intensity.* At one time, one is slightly in pain; at another, in excrutiating pain. At one time, one is a little sad; at another crushed with

sorrow. At one time, one is studying slightly; at another, very hard.

2. They differ in *quality*. At one time, our consciousness is painful; at another time, pleasurable. At one time, our consciousness is one of surprise; at another time, one of being bored. These differ in quality.

3. They differ in the *extent* of the conscious field. Sometimes there are but few things in the conscious field compared with what there are in it at other times. If one were intently studying the petals of a primrose in his hand his conscious field would be narrow as compared with his conscious field when he is looking at a landscape in the distance.

4. They differ in the *speed* with which objects cross the conscious field. At one time, ideas succeed each other very slowly in consciousness; at another time, they jostle each other in a mad rush, and go across the conscious field at a galloping pace.

Functions of Consciousness.—Consciousness has several functions, the chief ones of which are as follows:

1. *It enables the mind to know one mental experience from another.* This function is of the highest importance to the mind. If the mind could not tell one mental experience from another it could not know a pebble from a pumpkin; a dewdrop from an ocean; a man from a mushroom; a mouse from a mullen stalk; a hat from a hammer, nor a cabbage from a carrot. In short, one could never get started in getting knowledge.

2. *It enables the mind to know the value of its experiences to itself.* Without this function of con-

sciousness the mind would never know what of its experiences to avoid and what to repeat. It could not tell which are good for it and which are bad for it. It could not tell whether good intentions or bad intentions are to be cultivated.

3. *It enables the mind to direct its activities so as to do mental work.* Without consciousness the mind's activities would scatter over all creation as they do in dreams. No one thing could be held in mind long enough to be thought out. Mental activity would waste itself in aimless wandering, if consciousness did not cling to some purpose.

4. *It enables one properly to estimate himself.* Since consciousness enables one to know the condition of his own mind, it enables him to estimate himself. It enables one to know how much he knows, how much his knowledge is limited, the purity of his motives, the quality of his intentions and the strength of his will power; in short, to know himself.

Education of Consciousness.—One's consciousness is educated when it reveals accurately to him his mental conditions. The difference between the man whose consciousness is educated and the one whose consciousness is not educated lies in the fact that one whose consciousness is educated knows pretty accurately his own worth, while the one whose consciousness is not educated usually either overestimates or underestimates himself. Consciousness becomes educated by study and research, just as one grows in any kind of education.

Read:
1. Halleck's Psychology, pp. 44-52.
2. Pillsbury's Essentials of Psychology, pp. 46-59.
3. Angels's Psychology, pp. 47-63.

CHAPTER VII.

ATTENTION.

Nature of Attention.—The most persistent thing of which the human soul is conscious is change. Changes in the mind's environment and changes in the mind itself are the things studied in every study of the mind. Anyone of these changes definite enough to be separated from other changes is *an experience.* Thus an experience is a change of some sort, and a mental experience is a mental change of some sort. Mental life is a succession of these changes or experiences, and so is physical life.

Most of our mental experiences go forward without the mind's being *clearly* conscious of them. The mind though has the power of bringing any experience *clearly* into consciousness and of focusing its energy upon it after it is in consciousness. This the mind is able to do because of the attribute of *attention.*

Thus the mind is able to do the two following things because of attention:

1. The bringing of some experience *clearly* into consciousness.

2. The focusing of its energy upon it.

A little introspective study shows that at most times there are many things in one's mind. As one sits in his study he sees books, furniture, pens, pencils,

papers, the scenery outside his window, and many other things; he, perhaps, hears children shouting at play, the singing of birds, the cackling of chickens, the rushing of the train, the clatter of wagons on the road, the ticking of the clock, and so on. In short, a large number of things are more or less in his consciousness. Most of these things, or better the experiences aroused by these things, are only dimly in consciousness. But because of the attribute of attention the mind is able to exalt any one of these dimly conscious experiences into clear consciousness. And this is the first thing the mind is able to do because of attention. It is a differentiating function of the mind. It is the process of separating one experience from a more or less integrated mass forming a substratum in consciousness.

The second thing which the mind can do because of attention is that of narrowing down the field of consciousness. It is what is usually called *concentration.* It is somewhat analogous to focusing the rays of the sun by means of a lens, which consists in narrowing down the focal field by converging the rays toward a point.

From the above study the following definition of attention is reached:

Attention is that attribute of the mind by virtue of which the mind brings some experience clearly into consciousness and focuses its energy upon it.

Illustration.—One is sitting in his room engaged in reading the morning paper. The clock is sitting upon the mantel shelf ticking away as loudly as usual, but he does not hear it clearly, though there is a sort of dim

consciousness of its ticking. Suppose some one says "Hows clearly the clock ticks!" Immediately he hears it clearly. That is to say, the mind brings clearly into consciousness the experience aroused by the ticking of the clock and focuses its energy upon it.

Condition of Attention.—There are certain conditions which must exist in order to have attention of any kind, good, bad or indifferent. These may be grouped as follows:

1. The condition of the self stimulated.
2. The nature of the stimulus stimulating.

In order to give good attention one must have a normal healthy nervous system and a normal mind in a healthy natural condition. No one suffering from disease, fatigue, worry, inferior or unhealthy nervous organization can rightly be expected to give vigorous and prolonged attention. It is a physical and mental impossibility. This may be summed up in the statement that one condition necessary to vigorous, prolonged attention is a healthy vigorous tone of the self, both mental and physical.

From the student's point of view there are at any rate four things fatal to habits of vigorous, concentrated prolonged attention. They are as follows:

1. Food insufficient in quality or quantity.
2. Insufficient physical exercise.
3. Insufficient pure, fresh air.
4. Insufficient quantity of sleep.

Food insufficient in quantity and quality affects the vigor and tone of the whole being physically. And the

relation between physical and mental is so close that the power of attention suffers in a corresponding degree.

It is a law of life that a healthy state of any organ or system of organs is maintained only by a healthful amount of exercise. Lack of exercise brings on languor, ennui and blase'. These conditions, due to the dependence of one's mental life upon the physical, make strongly against attention.

Bad air is the bane not only of health in the schoolroom, but of comfort, vivacity and all that goes to make school life a pleasure and a success. Every adult should have 3,000 cubic feet of fresh air per hour, or fifty cubic feet per minute as the minimum for the *best* attention. Of course, people can live on a smaller quantity of fresh air. It is not the intention to say they can not. But it is the intention to say that vigorous, prolonged, concentrated attention can not be maintained to its maximum under any other conditions.

Lack of sleep is a common and prolific source of poor attention in school work. No one who is sleepy can give very good attention to anything. It does not, however, seem generally to be understood that every one should have as the minimum seven hours of sleep in every twenty-four preferably in a majority of cases from 11:00 p. m. to 6:00 a. m. It is worthy of emphasis that this is the minimum. It is also true that in the cases of most persons more than seven hours in twenty-four are demanded. Again it is not the intention to say that one can not live on fewer than seven hours of sleep in every twenty-four, but it is the inten-

tion to say that he can not feel vigorous, happy, sweet-tempered; in short, be his best self, continuously on less than seven hours of sleep in every twenty-four. It is certainly a well established truth that good attention demands seven or more hours of sleep in every twenty-four.

The kind of stimulus has much to do with the attention. The reason why some things in themselves seem to attract and hold the attention is due to the stimulus they furnish. A blinding flash of lightning or a terrific crash of thunder will attract one's attention under almost any set of circumstances. A runaway horse dashing down the street will do the same thing.

A story is told of a clergyman who, talking in loud, monotous tones, was astonished to see many of his congregation sleeping. He spoke a sentence or two in a hollow whisper and several of them awoke with a start. Thus change in the stimulus attracts attention. It is the quality of the stimulus which the teacher manipulates in holding the attention of his students.

Classes of Attention on Basis of Direction. — At times one seems to be attending to things outside of his mind, and at other times he finds himself attending to things in his mind. Said in another way, sometimes one's attention is directed inward and sometimes outward. Thus on this basis there are two classes of attention, and they are called:

1. External.
2. Internal.

External attention is that kind of attention the stimulus of which is outside the mind.

Internal attention is that kind of attention the stimulus of which is in the mind.

Illustration.—If one is sitting at his window and watching intently the frolics of the jaybirds among the trees upon his lawn, his attention is *external.* But if he is thinking of his own motives, hopes, aspirations, likes, dislikes, and so on, his attention is the *internal kind.*

Classes of Attention on Basis of Effort.—By introspective study of our own attention we discover that at some times we give attention without any seeming effort, while at other times conscious effort is required to give attention. In the first case the attractiveness of the stimulus is so great that the mind is held to it without any apparent effort, while in the second case the stimulus fails to hold the mind. In either kind of attention there is involved *some* effort, but in the one kind the effort is not a *conscious* one, while in the other there is peculiarly a *conscious* effort. This difference in attention gives basis for dividing attention into two classes:

1. *Non-voluntary.*
2. *Voluntary.*

The following are formal definitions for them:

Non-voluntary attention is that kind of attention in which no conscious effort is involved.

Voluntary attention is that kind of attention in which a conscious effort is involved.

It is popularly thought that voluntary attention is a much higher kind than the non-voluntary and that it

is the kind possessed by men and women of great ability, by geniuses. In fact one frequently hears it said that the only difference between the genius and the ordinary man is in the power of voluntary attention. A little introspective thought, though, shows that voluntary attention is not of long continuous duration with any one. When the mind strays away from the object of attention, by an effort it is hauled back and forced upon it. But if the mind stays there very long, it will be found that what was voluntary attention has changed into the non-voluntary kind and the mind is held by the attractiveness of the stimulus. Unless there is such attractiveness about the object of attention, the mind can not stay there and no attention of any kind will exist for it. The effort of attention will prove to be spasmodic attempts at short intervals to hold the mind upon some object of consideration. Thus voluntary attention is a momentary affair and is itself very quickly exhausted in the effort.

The attention of the genius is almost wholly of the non-voluntary kind. He attends with concentration to any object under consideration for a long time because it awakens so many new and interesting connections and suggests all sorts of pleasant associations, thus opening up various and multiform avenues of thought.

To the ordinary man not so richly endowed the connections are fewer, and since there is nothing to hold the mind, it soon wanders, and it is said to lack concentration. Thus the ordinary mind has much more opportunity to exercise voluntary attention than the mind of the

genius. It is much more of a necessity for the ordinary mind to exercise voluntary attention than it is for the mind of the genius.

Basis of Attention. — The basis of attention is *interest.* And by this is meant the mind gives attention to that in which it is interested and does not give attention to that in which it has no interest. This is true, but what is interest?

To the mind dissatisfied with vagueness, it is hardly sufficient merely to say or think that interest is the basis of attention. The meaning of interest must be made more definite.

An examination of various cases of interest shows that when one is interested in a thing he has a *feeling* for that thing. Thus one's interest in a thrilling story is his *feeling* for that story; and a child's interest in sweetmeats is his *feeling* for sweetmeats. Thus interest is a *feeling.* But in interest there is always the additional thought that the object or action in which the mind is interested is the cause of the feeling, and the mind so regards it. Thus the following definition of interest is reached:

Interest is any feeling for an object or action which the mind regards the cause of the feeling.

One's interest in art is his feeling for art, the mind regarding the art as the cause of the feeling. And a man's interest in his family is his feeling for his family accompanied by the idea that the family is the cause of the feeling.

Classes of Interest.—An examination of one's inter-

ests shows that he is interested in some things because of themselves and in some other things not because of themselves, but because they are a means to some other thing. Thus much of the routine of daily labor is done because not of interest in it as an end, but because of interest in it as a means to something beyond, the money received for it or some other kind of remuneration. One's interest in an absorbing piece of music or a thrilling narration points to nothing beyond itself. It is exhausted in the act. This difference in our interests is basis for classifying them into:

1. *Direct.*
2. *Indirect.*

The following are definitions for these two classes of interest:

Direct interest is that kind of interest which the mind has for something as an end.

Indirect interest is that kind of interest which the mind has in something as a mere means to an end beyond.

Direct interest is the interest with which one works when he loves his work. It is the interest which furnishes the basis for most of life's happiness. It is the only kind of interest which is an effective guarantee of good work. Work in which there is a direct interest is invariably better done, and there is much pleasure in doing it. Work done with only an indirect interest is drudgery and the tendency always is to slight it.

The art of correct living is largely included in learning to do one's work with a direct interest in the neces-

sities and vicissitudes of daily life. All work however humble or hard may thus have pleasure in it.

From the teacher's point of view the aim should always be to secure direct interest from the children in their work. And the teacher who is able to do this largely finds his opportunities for helping his children broad, and his satisfaction in his own endeavor deep.

No teacher, though, can secure direct interest from all his pupils at all times. The varying conditions of life, the influences of heredity, the previous environment and disposition of children with their limitations of knowledge make it many times an impossibility. From which it turns out that some aspects of school work will always be drudgery to some children, much the same as some aspects of life's work will always be drudgery to many people. In such cases the work must be done with an indirect interest.

People are often unaware that they are criticising themselves when they say that they can not get interested in this or that. The natural healthy attitude of the mind is interest in all things. And to be unable to get interested in a thing is a sure indication of an unhealthy attitude of mind or of a mind with such a small store of knowledge that the new thing has few or no connections, or associations, or it may be an indication of both, as it frequently is. One who says he can not get interested in a thing is thus saying that he is so ignorant, that he does not know enough about it to be interested or that he is not healthy in mind. Thus one who is not able to get interested in a subject should look within for

the difficulty and not outward. He will also do well to keep still about it, unless it is the desire to show an abnormal, unhealthy condition of his soul or an undeveloped ignorant state of the self.

From the above it is seen that people's interests are quite usually too shallow and too narrow. That is to say, most persons are not deeply enough interested in enough things. Most persons have a sort of fleeting shallow interest in many things, but an intensive interest in a very few things. Thus their lives are touched very lightly by most things, and they live only a very small part of life's possibilities. Their lives can not be full and rich and strong. Only deep life interests in many things can make the current surge full and strong.

The Law of Interest.—The question, Why is one interested in a thing at all? suggests itself. If one studies his own interests for a short time, he will find that he has interest in that which gives or promises *pleasure* or *pain.* If one is interested in studying or reading Tennyson's Bugle Song, it is likely to be because it gives him pleasure. The pleasure one has in a thing may be sensuous or intellectual, real or imagined. The child is interested in an apple or a stick of candy because of the sensuous pleasure it furnishes him. The advanced student is interested in his algebra problem because of the intellectual pleasure it furnishes him.

The boy is not interested in a strapping he is experiencing because of the pleasure it furnishes, but because of pain. The traveler lost in the forest is not interested in the howling wolves because of the pleasure the howl-

ing of the wolves furnishes, but because of the pain, but he is just as truly interested.

Thus not only agreeable things but disagreeable things as well awaken interest. There is more than one way for a thing to be made interesting.

From the above study the following law of interest may be stated:

The mind is interested in whatever gives or promises pleasure or pain.

Laws of Attention.—The following are statements for some of the most important laws of attention:

1. The mind can not attend to uninteresting things.

2. Attention to an unvarying stimulus can not long remain vigorous.

3. Attention centered on an unvarying stimulus tends to produce a hypnotic or comatose condition.

4. When the mind's power of attention is fatigued it may be rested by directing it into new channels or by giving one's self up to non-voluntary attention.

Things entirely without interest never so much as find their way into consciousness and the mind can get no hold at all upon them to give them the attention. But many things which awaken a sort of fleeting interest never call forth a real effort of attention because of the shallow interest. The only way to secure effective attention is to work for deep interest. We find time always in life's frantic struggle to attend to those things for which our interests are so strong that they have become passions.

It is a common observation as well as a common experience that monotony kills attention. That is to say lack of variety, sameness in stimulus or sensation always has a deadening influence on attention. A public speaker who uses a monotonous tone fails to hold attention. A story repeated in an unvarying way ceases to hold attention.

The mental capacity for action in any unvarying direction is small, and soon becomes exhausted. As soon as it is exhausted the attention in that direction must of course cease.

Many experiments have been conducted to show that attention to an unchanging stimulus will stupefy one and throw him into a sort of unnatural sleep or into a sort of comatose state, a semi-conscious condition.

It gives some rest when the mind becomes tired of attending to one line of work, say history, to direct it into new channels, such as arithmetic, or just to let the mind follow its own associations in a state of relaxation. Such rest, though, is only a matter of redistributing the mental energy and nervous energy. Real rest with an increase of nervous and mental power comes only from cessation of attention in sleep. Sleep is the great restorative for all sorts of mental and physical fatigue.

Importance of Attention.—"There is a constant struggle on the part of sensations to survive in consciousness. That sensation which we allow to take the most forcible hold on the attention usually wins the day. If we sit by an open window in the country on a sum-

mer day, we may have many stimuli knocking at the gates of attention.'' Unless we select out some one thing and center the attention upon it, nothing but mental chaos results. If we give ourselves up to every passing stimulus we belong more to our environment than we do to ourselves.

For the sake of the mental habit, one can not afford to do less than pay such attention to any public speaker, teacher, or preacher as that which would enable him to give the chief points in synopsis of the address, if called upon to do so. Practice in doing this very thing, giving a synopsis of the address, is a most stimulating and helpful exercise in acquiring good habits of attention.

Concentration.—Concentration, the power to focus the mind's energy upon a small field of consciousness for periods of considerable duration, is frequently thought to be an absolutely necessary characteristic of marked ability. It is even thought that, if one does not possess this presumably happy power to a considerable degree, he can not amount to much as a thinker. A degree of power of concentration is a very desirable characteristic to possess, but there is a possibility of its being carried too far. Extreme concentration is absent-mindedness. It is the condition in which one forgets everything except the subject of immediate thought: forgets to eat; forgets to answer his letters; forgets to keep his appointments; forgets to speak to his friends; forgets what he goes to market for; in short, forgets a thousand things which the highest success in life demands he should remember.

Then too much concentration, as well as too little, is at times both mentally and physically inconvenient.

And it is not necessarily true that one must possess the power of concentration to a high degree in order to be a success in the world. Professor William James puts this truth well in the following: "This concentrated type of attention is an elementary faculty; it is one of the things that might be ascertained and measured by exercises in the laboratory. But, having ascertained it in a number of persons, we could never rank them in a scale of actual and practical mental efficiency based on its degrees. The total mental efficiency of a man is the resultant of the working together of all his faculties. He is too complex a being for any one of them to have the casting vote. If any one of them do have the casting vote, it is more likely to be the strength of his desire and passion, the strength of the interest he takes in what is proposed. Concentration, memory, reasoning power, inventiveness, excellence of the senses—all are sudsidiary to this. No matter how scatter-brained the type of a man's successive fields of consciousness may be, if he really care for his subject, he will return to it incessantly from his incessant wanderings, and first and last do more with it, and get more results from it, than another person whose attention may be more continuous during a given interval, but whose passion for the subject is of a more languid and less permanent sort. Some of the most efficient workers I know are of the ultra-scatter-brained type. * * * * * I seriously think that no one of us need be too much distressed at his own short comings

in this regard. Our mind may enjoy but little comfort, may be restless and feel confused; but it may be extremely efficient all the same."

Read:

1. Angell's Psychology, pp. 64-90.
2. Pillsbury's Essentials of Psychology, pp. 104-129.
3. James' Talks to Teachers on Psychology, pp. 91-115.
4. Dewey's Psychology, pp. 132-148.

CHAPTER VIII.

Apperception, Self-Activity, Iterativeness, Rhythm.

Nature of Apperception.—This is another attribute of the mind without which knowing would be an impossibility and without which feeling and willing would remain undeveloped.

All learning is the mind's process of *getting meaning*. But to say this does not help much without one's having a perfectly definite idea of what *meaning* is. At first thought it seems that objects around one in the world have meaning, but a closer study shows that this is not the case. The mind in studying a thing appears to get meaning from it, it is true, but when it can not in any way connect a thing with its past experiences it gets no meaning from it. If the thing has small connection with the mind's experiences, the mind gets small meaning from it. If the thing has many connections with the mind's experiences, the mind gets much meaning. Thus in learning a thing the mind gets meaning from it just to the extent it has past experiences and can connect these with the present experiences. Now if the mind has had ever so many experiences but not like the ones the thing it is trying to learn arouses, it will get no meaning. Thus the mind connects the past and present experiences by seeing the likeness between them; but to

see likeness, there have at the least to be two things, and to be two things there must be differences. So the mind connects its experiences by seeing the likenesses and differences between them.

And from the above truths the inference is that *meaning is the likeness and difference between our experiences* and is in the mind.

But what makes one thing put us in mind of another? What enables the mind to connect its experiences, the present with the past? *Apperception.* Apperception is the attribute of mind which enables the mind to do this, that is, connect the present with the past experiences.

But this is not all that apperception enables the mind to do. Apperception enables the mind to *change itself permanently* with each experience. Every experience the mind has leaves the mind a little different from what it was before it had the experience. The mind may forget the most it has learned, but it never entirely loses the effect of the activity it put forth in learning it. The mind never is again after an experience just what it was before the experience. The effect of the experience becomes organized into the self.

What Apperception Enables the Mind to Do. — From the above study it appears that the mind is able to do two things because of apperception. They are as follows:

1. *It enables the mind to bring past experiences to bear upon the present experience in getting its meaning.*

2. *It enables the mind to organize the effect of the present experience into itself.*

The mind learns only by bringing the past experience to bear upon the present. It is to be noticed that it does this consciously some times but most usually unconsciously. Thus when one sees a flower and says that it is a beautiful rose, he is not usually conscious that he is bringing his past experience to bear upon the present, but he is so doing nevertheless. In some cases one is perfectly conscious he is bringing the past experience to bear upon the present one, but usually he is not.

The organizing the effect of the experience into the self may appropriately be called *mental assimilation.* The effect of the experience becomes a part of the tissue of the mind, so to speak, as the food becomes a part of the tissue of the body through physical assimilation.

Definition of Apperception.—The following is the formal definition of apperception, obtained from the previous study:

Apperception is that attribute of mind by virtue of which the mind brings its past experiences to bear upon the present experience in getting its meaning, and by virtue of which the effect of the present experience is organized into the mind.

Illustrations.—If one who knows nothing of geology were walking down a valley and should find a rock almost round, but having a plane surface as if it were worn off by holding it on a grindstone, he would probably get much the same meaning as he would by looking at any other rock. But if a geologist should find it, he

would connect his past experience with that aroused by the rock and say it called to his mind an ice age, when tremendous ice fields covered all the northern part of Indiana. To one man it means much; to the other one, very little. Each brought his past experiences to bear upon the present, but one had little similar experience while the other had much.

A child called a jardiniere of ferns "a pot of green feathers." The child had had experience with *pots,* with *green things,* and with *feathers* which it brought to bear upon the experience aroused by the jardiniere of ferns with which it had not had experience.

A small boy called a locomotive "a big bow-wow." He had had experiences with "bow-wows," dogs, which he brought to bear upon the experience aroused by the locomotive with which he had not had experience.

The south sea islanders called Captain Cook's goats "horned hogs." They had had experiences with hogs and horns, which they brought to bear upon the experiences aroused by the goats with which they had not had experience.

In each of the above cases the present experience was connected with the past in trying to get meaning. This the mind could do because of apperception.

The Laws of Apperception.—There are two important laws of apperception as follows:

1. *When the mind sees that elements in an experience are similar to those of a previous experience, it gives the new experience the same meaning as the old.*

2. *The mind in learning naturally goes to the unknown from the nearest related known.*

Illustrations.—The first law is illustrated by the following: A little girl just learning to talk learned what a pumpkin was from playing with a large round one just inside the garden gate. Then she called the moon, a marble, the sun, a ball and everything spherical in shape a pumpkin for a long time.

The second law is illustrated by the following: A little boy called the chicken's wings its *arms. Wings,* the unknown, was gone to from *arms,* the *nearest related known.*

Mastery of a Subject.—From the study of apperception, it is easily seen that the mastery of any subject consists of three things, as follows:

1. The understanding of the subject.
2. Fixing it in mind.
3. Stating it in good language.

The mind is able to understand any subject on account of the first thing the mind does because of apperception. It is able to fix in itself anything because of the second thing the mind does on account of apperception. Stating a thing in good language helps, also, to fix anything in mind.

Self-activity.—In a sense probably everything in the universe possesses self-activity. Physicists tell us that the little particles of the stone, wood, soil and everything else are in a constant state of motion, or activity. This, however is not just the sense in which the term is

used in psychology. In the study here the term will be used in its psychological sense entirely.

Nature of Self-activity.—Some idea of self-activity may be had by comparing objects which possess it with those which do not. A sewing machine acts in sewing, but always from a power without itself. A threshing machine acts, but the cause of its activity is not within itself. All machines act in a manner similar to the threshing machine and sewing machine; that is, from a cause not within themselves. A plant acts in growing by taking food from the soil and air and making it over into plant tissue; that is, by making it a part of itself. A horse acts from a cause within himself in taking food and changing it into horse flesh; and, also, by moving from place to place, he acts. The horse moves from place to place, takes his environment, breaks down its individuality and makes it a part of himself. The human body acts in moving from place to place, changing itself to fit its environment to suit its needs.

The action of the plant, the horse, the human body, and also *the mind* are caused from within while the action of the machine is caused from without. The plant, the horse, the human body, and the human mind possess *self-activity,* but the machine does not. The mind is thus self-active, since it possesses the attribute by which it causes itself to act.

Definition of Self-activity.—From the above study the following definition of self-activity is reached:

Self-activity of the mind is that attribute by virtue of which the mind causes itself to act.

Law of Self-activity.—Without self-activity things never truly grow. Self-activity is at the basis of all growth. Everything which grows grows by means of self-activity. The mind grows by self-activity. The mind grows most when it is most self-active providing the activity is not carried to the extremity of exhaustion. Any activity may be carried so far that it ceases to be healthy and may result in breakdown or paralysis. Thus the law of self-activity may be stated as follows:

The mind grows by its own self-activity and grows most when exercised to the maximum healthful activity.

Nature of Iterativeness.—This is another attribute of the mind as fundamental as consciousness or attention. In brief *iterativeness* means the tendency of the mind to repeat its phenomena.

When the muscles of the arms and fingers perform the movements in making any character in writing for the first time or in playing the piano, the activity is done with difficulty and very unskillfully. Repeated attempts give more skill and success. Each act makes the performance a little easier to accomplish. Each act affected the muscles and the mind, and this effect remained with them in the form of a tendency. That is to say when an attempt was repeated the mind and muscles tended to act so as to make the action a little easier rather than to act in some other way. Thus each act of mind or muscle leaves a tendency.

But what is a tendency? We say the growing point of the stem of a plant has a *tendency* to grow upward, and the growing point of the root has a *tendency* to

grow downward. We fold a paper, and then say it has duck has a *tendency* to play in the water. What all a *tendency* to fold in the same place again. We say a these things are in the last analysis which we are accustomed to call tendencies is a mystery. We can not define a tendency, but we can characterize it as follows:

A tendency is a disposition to perform some activity.

Definition of Iterativeness.—The mind possesses the characteristic by which it has a tendency to repeat its activities. The following is the formal definition of iterativeness:

Iterativeness of the mind is that attribute by virtue of which the mind tends to act again as it has acted.

Function of Iterativeness.—It is difficult to estimate the value of iterativeness in one's mental life. Its value is so great that it can not be overestimated perhaps. The following are some of its functions:

1. It enables the mind and body to form habits.
2. It enables one to attain skill in activity.
3. It enables one to acquire arts, as walking, running, skating, talking, writing, and so on.
4. It enables one to remember. Without iterativeness there could be no memory.

The Nature of Rhythm.—When the word, *rhythm,* is mentioned, most persons probably think of poetry and music. Poetry and music possess rhythm, it is true, but rhythm is not restricted to them. It belongs to almost everything in the world. Everything from a dewdrop to an ocean, from a snowflake to a glacier, from a pebble to

a continent, possesses rhythm. Every leaf, every flower, and every blade of grass possesses rhythm.

An examination of things possessiong rhythm always shows that there is some characteristic, a departure from it and a return to it, and that things not possessing rhythm fail in this characteristic. Thus in a broad sense rhythm is as follows: *Rhythm is the thing itself, the departure from that thing and the return to it.* It does not matter what the *thing* is, just so there is the departure from it and the return to it. The following is rhythmical:

> "The day is cold and dark and dreary;
> It rains and the wind is never weary."

In this there is the sound symbolized by *eary* in the word, "dreary." This is the thing, and "It rains, and the wind is never w——" is the departure from it. The return is the sound of *eary* in the word "weary."

In the maple leaf rhythm is manifested by a portion on the right half always having a corresponding like portion on the left half, the parts between the like parts being different. One of the like parts is the thing, that between them is the departure from it, and the other like part is the return to it. The human mind possesses this tendency to act, to depart from the action, and to return to it. This is the mind's attribute of rhythm.

Since the mind is rhythmical it likes rhythm in anything and dislikes that which is not rhythmical. The world is full of rhythm and the human mind longs for it.

Definition of Rhythm.—From the above study the

following formal definition of rhythm as an attribute of mind is reached:

Rhythm of the mind is that attribute by virtue of which the mind has an activity, departs from it and tends to return to it at regularly recurring periods.

Function of Rhythm.—Without rhythm the activities of the mind as well as all other of life's activities would lack order, system, regularity and harmony. Thus the following is the function of rhythm:

1. *By rhythm the mind introduces order, regularity, system, and harmony into life's manifold and complex activities.*

CHAPTER IX.

Mental Activities.

Nature of Mental Activity. — By observation of one's own mind he can see that at one time he is thinking of probably arithmetic, and at another time of grammar; at one time he is sad, and at another time happy; at one time angry, and at another time in good humor; at one time striving to direct his activities, at another time resting. That is to say, one sees his mind different at different times. And for this reason he knows that his mind changes, that he sees it in different conditions at different times.

Now mental activity is the presupposition of the mind's being in different conditions at different times.

Classes of Mental Activities.—By looking into our minds to study their activities we are able to see that at some times our minds are almost wholly occupied in thinking; again they are depressed with sorrow or elated with joy; and at other times the mind seems to be doing nothing much but striving to direct its activities and the activities of the body. These distinctions among the mind's activities give basis for dividing them into three groups:

1. *Knowing.*
2. *Feeling.*
3. *Willing.*

Order of These Activities.—The order of these activities may be seen from almost any common illustration. For instance we read of the storm which devastated Galveston a few years ago, and understood that the people were left in desolation—*knowing;* we sympathized with them and were sorry for them—*feeling;* we directed our activities to send them money, food, and clothing—*willing.* Thus in any complete act of the mind the order of development is *knowing, feeling,* and *willing.*

Nature of Knowing.—In general all *knowing is the mind's process of getting meaning.* But that this statement may not be misleading the term, *meaning,* must be thoroughly understood. Most persons, at first thought, would probably say that meaning is something which objects in the external world have. That is to say, meaning seems to be in the books, in trees, in rivers, in flowers, and so on. But strictly speaking this is an error. Careful thinking shows that things very unlike what the mind has ever experienced seem to have very little meaning for it. And this truth carried on out shows that, if it were possible to find anything entirely different from anything the mind has ever experienced, the mind would get absolutely no meaning from it. Again, two persons look at the word, *obliviscor,* and while one gets no meaning from it, to the other, it means, *I forget.* So no two persons get precisely the same meaning from an object or event which they see. An object or event stimulates to an activity of the mind, and, if the mind has had past mental activities of a sim-

ilar character to connect the present activity with, it is said the mind gets meaning. Thus meaning is a thing which is in the mind. That is to say, *meaning is relation;* and further, it is the relation between present mental experiences and past mental experiences. But to trace this thought out further is to study *experience* and *relation.*

Experience will be found by accurate thought to mean any *change,* or *activity,* and any mental experience is any *mental* change, or activity.

Relation is the connection between the mind's experiences. It is the *likeness* and *difference* between the mind's experiences.

Definition of Knowing.—From the above study the following definitions of knowing are got:

Knowing is the mind's process of getting meaning. Meaning is the relation between the mind's experiences. Experiences are changes, or activities. Relation is the likeness and difference between the mind's experiences.

Knowing is the mind's process of grasping the relation between its present and past experiences.

Discriminating and Unifying.—Discriminating is seeing differences and unifying is seeing likenesses. The mind in knowing sees differences and likenesses between its experiences and thus discriminates and unifies. Thus knowing is both *discriminating* and *unifying.* The mind always discriminates *first* in knowing and unifies *secondly.* One thing necessary in knowing a maple tree is to see the difference between the mental activity it arouses and the mental activity aroused by the oak tree;

and a second thing necessary is to see the likeness between the activity aroused by the maple tree and the activity aroused by maple trees in the past.

The mind is not always reflectively conscious that it is seeing the likeness and difference between its experiences, but it sees them just the same.

Thus we arrive at a third definition of knowing: *Knowing is the mind's process of, first, seeing the differences, and, secondly, the likenesses between its experiences.*

All Knowing Indirect.—There is no way for the mind to get meaning directly from an object. The past experience must always come in as a means in knowing. This truth leads to the statement that *all knowing is indirect.* That is to say, in knowing, the experience aroused by any object is always referred to the past experience, and *this act of reference to the past experience* makes the knowing indirect.

Function of Knowing.—The question here is, Why does the mind want to know? What good is there in knowing? Careful reflection on this point leads us to believe that the mind needs to know *that it may direct itself and the body to act as they should.* There would be no need for knowing if there was no acting to be done. If one always knew the best thing to do next he would have no further need for knowledge. He would be as wise as he needs be. Thus knowledge ultimately has its end in activity.

Wisdom and Virtue.—Wisdom thus consists in knowing what is best to do next. If one possesses knowl-

edge which never in any way guides in knowing what is best to do next, it is not a part of one's wisdom. It violates the origin and function of knowledge. It is useless. Thus the difference between wisdom and knowledge appear. One is wise only to the extent to which he knows what is best to do next.

Thus *wisdom* consists in *knowing* what is best to do next under any set of circumstances, and *virtue* consists in doing it.

Nature of Feeling.—In general *feeling is the agreeable or disagreeable aspect of our experiences.* Every experience the mind has changes it both temporarily and permanently. The mind never is after an experience quite what it was before the experience. Some of these experiences change the mind for the better and some change it for the worse, but all change it permanently in some way. This change of the self by an experience is called the value of an experience. The value of an experience may be stated as follows:

The value of an experience is the effect of the experience on the self.

Experiences have two values to the self:

1. *Positive.*
2. *Negative.*

If the experience is in harmany with the growth toward well-being, the experience has a *positive* value; that is, if it furthers development toward well-being, it has a *positive* value to the self. If the experience is not in harmony with growth toward well-being, it has a *negative* value. That is to say, if the experience hinders the

development toward well-being it has a *negative* value to the self.

Now the mind has the ability of becoming aware, to a greater or less extent, of the value of experiences to itself. That is to say, the mind is aware or thinks it is aware, at least, when it has an experience, whether the experience furthers or hinders its growth in well-being. It is no doubt true that experiences are unfavorable to the growth in well-being, even when the mind regards them as favorable. And it holds equally true that an experience may be favorable to growth in well-being, yet the mind regard it as unfavorable.

When the self has an experience, and becomes aware, or supposes it is aware, of the value of this experience to the self, the condition, or state, of mind which results is *feeling*.

Genesis of Feeling.—By genesis of feeling is meant the series of mental changes which result in feeling in specific instances. Thus one is not in sorrow, but later finds himself sad. Now, the question is, What series of changes of the self led to the feeling of sadness? This series is the *genesis* of feeling.

A careful study of the genesis of feeling reveals the following steps in it:

1. An experience.
2. Value of experience.
3. Awareness of value of experience.
4. Resultant state of mind—*feeling*.

Illustration.—A fire is pleasant on a cold day. The *pleasure* is a feeling. The fire stimulates one to an

experience. This experience furthers one's well-being—the *value* of the experience. The mind either consciously or unconsciously recognizes this value—the *awareness* of the value of the experience. The resultant pleasure—the *state of mind,* the feeling.

Definition of Feeling.—The following definition for feeling grows out of the genesis of feeling:

Feeling is the state of mind which results from the mind's becoming aware of the value of an experience to the self.

An analysis of this definition reveals the following points in it:

1. A state of mind.
2. An experience.
3. The value of an experience.
4. Becoming aware.
5. The self.

By state of mind is meant the *disturbed or agitated condition of consciousness.* It is a deeper thing than what is usually called a mental activity. In the activity of a muscle, the whole muscle acts together, but the individual molecules in the muscle act, too. The *activities* of the mind are comparable to the activities of the muscle as a whole, while the *state of mind* is comparable to the molecular action. It is an activity, but an unobtrusive, subtle activity of the self.

Feeling is always a *state,* or *condition,* of the mind, and is *always an accompaniment of activity or experience.*

An experience, as before seen, is any *change,* or

activity, whatever. It is what the feeling accompanies, and what feeling *indirectly results* from.

The value of an experience is *the effect of the experience on the life of the person.* This effect is in part temporary and in part permanent. One thing about it is certain, one's experiences organize his life, build his character, for a higher or lower destiny.

Becoming aware is the recognition by the mind either consciously or unconsciously of the value of an experience to the self. The thing become aware of is thus *the value of the experience.* It is not meant that the mind always *reflectively* and *consciously* thinks out the value of the experience to the self, but that it unconsciously, or implicitly, responds so as to indicate that this is what it has done.

The self in the widest sense is both the body and the mind. Thus there is a physical self and a mental self. The physical self is the self-active, self-adjusting organism called the body. *The mental self is the original power of the mind to know, feel, and will plus the effect of its experiences on it.*

Forms of Feeling.—All feeling is divided into the following large *forms, not classes*:

1. Love, or like.
2. Hate, or dislike.
3. Indifference.

Love, or Like.—When the mind has an experience which it *regards* as having a positive value to the self the feeling which arises is *love,* or *like.* The formal definition is as follows: *Love is the feeling which arises*

when the mind has an experience which it regards as having a positive value to the self.

It has sometimes been taught that we can *love* only persons, and that we *like* all other things. Such teaching is purely arbitrary and unwarranted. It is entirely correct to say we love flowers, poetry, paintings, music, truth, beauty, and goodness. One finds the term, love, so used in good English.

"Any object whatever may become an object of love or hatred, though it is usual to restrict these terms to higher objects."—Dewey.

Hate, or Dislike.—If the mind has an experience which it *regards* as having a negative value to the self, the feeling which arises is *hate,* or *dislike.* The formal definition is as follows: *Hate is the feeling which arises when the mind has an experience which it regards as having a negative value to the self.*

Indifference.—There is perhaps no such thing as entire indifference with respect to anything, but there are various degrees of it. The term, indifference, names a mental state and it should be studied and described in psychology.

If the mind regards the experience as having little or no value to the self, the state of mind which arises is *indifference.* The following is the formal definition: *Indifference is that state of mind which arises when the mind has an experience which it regards as having little or no value to the self.*

The Function of Feeling.—It is difficult to appreciate the value of feeling in the life of the individual.

Its functions can not well be overestimated. The three following points indicate these to some extent:

1. It makes life worth living.
2. It is a guide in human action.
3. It is the mainspring to all human activity.

Without feeling life would not be worth living. It is impossible to conceive what one would want to live for, if all feeling were taken out of life. No joy, no hope, no love, no happiness, nor pleasure would bless one's life, if there were no feeling. Feeling is thus the wine of life.

Feeling is a sort of safeguard which nature has thrown around us. Feeling *always accompanies activity.* If the activity furthers the growth toward well-being, a pleasant feeling accompanies it to urge us to repeat the activity for the development it furnishes. If the activity hinders growth toward well-being, a disagreeable feeling accompanies it to urge us to avoid the activity because of the hindrance to development. Thus feeling is a guide in action. However it may seem one is always ultimately guided by his feeling.

Feeling urges to activity; that is, it is a spring to action. Everything which one intentionally does, he does because of feeling; because he *loves* somebody or something. Thus love of truth has produced *science* and *philosophy;* love of beauty, *architecture, sculpture, painting, music* and *poetry;* also, many other beautiful things; love of society, the *family,* the *church,* the *school* and the *state;* love of goodness, *ethics.*

Nature of Willing.—A short accurate statement for

willing is *willing is the mind's process of controlling its impulses.*

Willing is a complex process involving both knowing and feeling, being characterized by *striving to act* in some way. The process of willing always begins with *an impulse.* Impulse is an *excess of energy, or a surplus of force.* Impulse produces some sort of activity.

The impulses which urge the little child to throw his arms and legs about in any direction before he is old enough to control himself are good examples of impulses.

By a rather complex process in willing impulse is changed into *desire. Desire is a feeling directed toward something which it is thought will satisfy that feeling.*

Desire in the process of willing is changed into *choice.* Then lastly the mind directs the activities of the self toward the *realization of the choice;* that is, toward carrying out the choice.

Definition of Willing.—The following are both accurate definitions of willing:

1. *Willing is the mind's process of controlling its impulses.*

2. *Willing is the process in which the mind changes impulses into desire, desire into choice, and in which the mind tries to realize the choice.*

An analysis of this definition shows the following points in it:

1. Impulse.
2. Desire.
3. Choice.

4. The process by which impulse becomes desire.

5. The process by which desire becomes choice.

6. The process by which the mind seeks to realize the choice.

Impulse as seen before is *a surplus of force.* It furnishes the power to make the whole process of willing go.

Desire is a feeling for anything which the mind thinks will satisfy the feeling. Thus one's desire for a drink is his feeling for the drink with the additional point that the mind thinks the drink will satisfy the feeling. And so it is with every desire.

A careful analysis of the process by which impulse becomes desire shows the following points involved in it:

1. The mind is conscious of its real condition.
2. The mind sees an ideal condition of itself.
3. The mind compares these two.
4. The mind decides which is better.
5. A feeling of dissatisfaction arises.
6. A *desire* arises.

Illustration.—A student knows of a lecture, which arouses an impulse in him. He is at home—his real condition; he thinks of his being at the lecture—the ideal condition; he compares these two; he decides that to be at the lecture is better than to be at home; he is dissatisfied to be at home, and so desires to have himself at the lecture.

In the process of changing the desire into *choice* there may be involved *a conflict of desires;* that is, the mind may desire two things or more, the possession of

one of which precludes the possession of the other or others. In the illustration given the student probably desired to stay at home and study his lesson, but he also desired to be at the lecture. Since he could not both go to the lecture and stay at home, there was a conflict of the two desires.

The selecting the desire to go to the lecture and dropping the other out of mind was *the choice.* Thus *choice is selecting a desire and dropping out of mind any other desire in conflict with it.* The thing chosen is thus a *desire.*

An analysis reveals the following in the process by which desire becomes choice:

1. Two or more desires before the mind.
2. The mind compares these.
3. The mind decides which is better.
4. The selecting of the better one—*the choice.*

The process in which the mind tries to realize the choice, consists in *the mind's directing the mental and physical activities to perform the deed. The directing is purely mental,* but the activities directed may be either mental or physical. In the above illustration, the mind's directing the physical activities of going to the lecture was the process in which the mind was trying to realize the choice.

The process of realizing the choice may be short or may continue through years. It may be extremely difficult and complex, and never is entirely simple.

The Functions of Willing.—Repeated acts of the

will give self-control and character. Thus the functions of the will are in general two:

1. *Self-control.*
2. *Character.*

Self-control is of three kinds: *physical, prudential,* and *moral.* Character is of two kinds: *good* and *bad.*

Intellect, Feeling, and Will.—We must distinguish between a power of mind and the resulting activity. Thus one may have the power to run and not be running at all. Thus there is a distinction between the power to run and the activity of running.

Intellect is a power of mind, the power *to know.* Knowing is an activity and the intellect is the power which is back of the activity of knowing. The following is a formal definition for intellect:

Intellect is the power by which the mind grasps the relation between its present and past experiences.

In a similar way feeling and will may be defined as powers, as follows:

Feeling is the power of having agreeable and disagreeable aspects to our experiences.

The will is the mind's power of controlling its impulses.

Opposition between Knowing, Feeling and Willing. —Knowing, feeling and willing oppose each other to some extent. Thus one can not know and feel and will to the maximum at the same time. If most of the mental energy is employed in knowing, feeling and willing are weakened. Or if one is feeling to the maximum, it opposes knowing and willing. The expression, *one is*

so angry he has no sense, means feeling opposes the best work of the intellect.

All in All.—In every complete mental activity knowing, feeling and willing are all involved. There is no complete activity of the mind which is just knowing or just feeling or just willing. All are involved in every complete activity. Thus all is in all in psychology.

If the predominating element in an activity is knowing, the act is called one of knowing; if it is feeling, the act is called one of feeling; if it is willing, the act is called one of willing. Thus mental activities are named on the basis of their *predominating* element.

CHAPTER X.

The Sensation.

Nature of the Sensation.—The sensation is the first, most primitive, and least developed conscious mental activity which the mind ever has. It is the first conscious step in the mental changes succeeding the physical changes in one's life. It is the first conscious step across from the purely physical to the mental. It is the first consciousness resulting from external stimulus.

If one places his hand on a chestnut burr, it acts as a stimulus, which excites the peripheral nerve ending. This disturbance of the peripheral nerve ending extends along the nerve fiber to the brain and there arouses a disturbance. This disturbance of the brain is followed by a disturbance in the mind from which there results a state of consciousness. *It is this resultant state of consciousness which is the sensation.*

Thus the succession of steps leading up to and including the sensation are:

1. Stimulus.
2. Excitation of peripheral nerve ending.
3. Transmission of impulse.
4. Disturbance in the brain.
5. Corresponding mental disturbance.
6. The resultant state of consciousness, that is, *the sensation itself.*

Stimulus, as before seen, is always some kind of *motion* which comes in contact with some part of the nervous system. Thus the stimulus of hearing is motion in the air; the stimulus of sight is motion of the ether; the stimulus of touch is motion in the molecules of matter; the stimulus of the muscular sense is motion in the muscles.

Impulse is an *excess of energy,* or *a surplus of force.* Thus in the transmission of the impulse one particle of nervous matter has an excess of energy and strikes against another particle and transfers some of its energy to it; and it in turn strikes the next, transferring some of its energy to it, and so on till the impulse reaches the brain. Then the disturbance spreads and produces a small or large disturbance in the brain, depending upon the force of the stimulus and the tension in the brain.

Just how a disturbance of the mind results from the disturbance in the brain is not known. If this were known the exact connection between the mind and the body could probably be worked out. In our present state of knowledge this connection is a mystery. But we know positively that there does result a mental disturbance.

It is this mental disturbance which arouses consciousness; that is, arouses the sensation. And since one can no more be conscious without being conscious of something than he can eat without eating something, *the sensation is the consciousness of the mental disturbance.*

Definition of Sensation.—The sensation may be de-

fined as follows: *The sensation is the first state of consciousness resulting from external stimulus.*

The popular notion of sensation is usually vague. It is not uncommon to hear the term, sensation, used for stimulus and impulse. Sensation is often thought of as a physical thing, and is spoken of as being transmitted. No sensation is a physical thing and no sensation is ever transmitted. Four steps leading to the sensation are physical, but the sensation itself is a state of consciousness, and consciousness is purely a mental thing.

Classes of Sensations.—There are two classes of sensations:

1. *General, or organic.*
2. *Special.*

General, or organic, sensations are those which give us a knowledge of the ill-being or well-being of our bodies, and have no special sense organs. Any organ of the body which has nerves is an organ of general sensation. *Pain, fatigue, hunger,* and *thirst* are general sensations.

Special sensations are those which give us a knowledge mainly of objects around us, and have special sense organs. *Light, sound, odor,* and *flavor* are special sensations.

Characteristics of Sensations. — Sensations have three characteristics. They are as follows:

1. Quality.
2. Intensity.
3. Duration.

Quality.—The quality of sensations is the main difference between sensations. It is it more than anything

else which enables the mind to tell the differences among material objects. No two objects stimulate the mind to quite the same sensations in quality. The mind knows hot from cold, rough from smooth, sweet from sour, white from black, one man from another, and so on because of a difference in the quality of the sensations.

Causes of Difference in Quality.—There are several causes of the difference in the quality of sensations, some of which are the following:

1. *Difference in the quality of the stimulus.* This is the main cause of the difference in the quality of sensations. The song of the robin gives different sensations from the song of a hen, the lowing of cows, different from neighing of horses. The rose gives different sight sensations from those given by the lily. A feather gives different touch sensations from those given by a stone. A carnation gives different sensations of smell from those given by the hyacinth. An apple gives different taste sensations from those given by a strawberry. These differences in the quality of sensations are all due to differences in the quality of the stimuli.

2. *Difference in the sense organ stimulated.* If the same stimulus, as an electrical current, be applied to the eye and the ear, sensations different in quality result.

3. *The time for which the stimulus acts may change the quality of the sensation.* After one looks at red for a long time it may appear green.

4. *The intensity of sensation changes its quality.*

A moderate degree of warmth is pleasant. But by increasing the stimulus the sensation becomes painful. A light gives a pleasant sensation. But increase its intensity and a place is reached where it becomes painful.

Intensity.—The intensity of the sensation means the force with which a sensation affects one. It is very well illustrated by the difference in the sensations aroused by a light of ten candle power and one of seventy-five candle power, or by the difference in the sensation aroused by a kerosene lamp and by that of an electric light.

Causes of Difference of Intensity.—The following are causes of the difference in the intensity of the sensation:

1. *The intensity of the stimulus.* The cause of the difference in the intensity of the sensation aroused by a candle and by the sun is that the stimulus from the sun is more intense than the stimulus from the candle. Also, the cause of the difference in the intensity of the sensation from the report of a rifle and from a peal of thunder is in the intensity of the stimulus.

2. *The attention the mind gives it.* If the attention is centered on the pain from a slight wound, it becomes more intense. If no attention is given to wounds they often are not at all painful.

3. *The conditon of mind and body.* A noise that gives but a slight sensation when one is feeling well gives a much more intense sensation when one is not feeling well. "If we have a headache, a noise that we should not ordinarily notice may seem unbearable."

4. *Contrast in stimulus.* "Let A be a bowl of cold water; B, a bowl of hot water; C, a bowl of lukewarm water. Plunge the right hand into A, the left into B; then withdraw both and plunge them into C. The lukewarm water will seem warm to the right hand, cold to the left." Thus contrast affects the intensity of the sensation.

Limits of Sensation. — Our sensations do not acquaint us with all the phenomena of the world in which we live. In fact they acquaint us with only a small part of it. Thus the ear can not acquaint most persons with vibrations in the air below thirty per second and above 36,000 per second. There are vibrations in the air below thirty and above 36,000 per second, but we have no sensations to give us a knowledge of them.

We have no sense which gives us sensations of the vibrations of ether before they reach 18,000,000 per second, when we get sensations of heat. Then there is a jump to the sensation of light at about 462,000,000,000,000 per second, which gives red. They increase as we pass from one color to another until about 733,000,000,000,000 per second is reached, which gives violet. Beyond this the eye does not give us sensations, so all is darkness.

Thus our sensations are limited to a very small amount of the phenomena in the world about us. There is no knowing how the world would appear if we had a dozen more senses.

The Threshold of Sensation.—"There is always inertia to be overcome in rousing nervous matter. A cer-

tain amount of stimulus is expended in this. If no more is added, there is no sensation. When the inertia is once overcome, the sensation will perist for a time after the cessation of the stimulus. Atmospheric vibrations at the rate of ten per second do not sufficiently stimulate the brain to render us conscious of sound. When they reach a minimum of from sixteen to thirty, they enter the threshold of human consciousness; and at a maximum of 36,000, they pass out by the upper threshold. The cat can hear sounds inaudible to man, and hence has a lower aural threshold.'' Thus sensations have two thresholds:

1. *Upper.*
2. *Lower.*

Intensity of Sensation not Proportional to Intensity of Stimulus.—The increase in the intensity of the sensation is not proportional to the increase in the intensity of the stimulus.

''Within certain limits, any sensory stimulus may be augmented without increasing the sensation. We should not perceive increased intensity in a sound when augmented one-fourth. An ounce might be added to two pounds without detection by the pressure sense. The additional stimulus necessary to increase the intensity of a sensation varies for different senses. Sound must be increased one-third; light, only one one-hundredth.''

Thus doubling the stimulus in intensity does not double the sensation in intensity.

Duration.—The duration of the sensation has refer-

ence to the time which it lasts. Thus the difference between a whole note and a half note of the same pitch, intensity, and quality, is in their duration. Again, some tastes endure for a long time while others disappear quickly; that is, the duration of some is greater than of others.

The Local Sign of Tactile Sensations.—There is something about touch, or tactile, sensations which enables the mind to know the point of application of the stimulus. Thus when the foot is touched the mind does not make the mistake of thinking it is the face which is touched. This characteristic of the sensation is the *local sign.* The formal statement for it is as follows: *The local sign of tactile sensations is that characteristic of them which enables the mind to tell the point of application of the stimulus.*

Aspects of the Sensation.—If one should put his hand upon a hot stove, the sensation got would (1) enable him to know something; (2) give pain; and (3) stimulate him to act. Thus there are three aspects to the sensation as follows:

1. *Intellectual.*
2. *Emotional.*
3. *Volitional.*

The intellectual aspect of the sensation is that one which enables the mind to get knowledge from the sensation. It furnishes the basis for the development of *knowing.*

The emotional aspect of the sensation is that aspect

which is pleasurable or painful. It furnishes the basis for the development of *feeling.*

The volitional aspect of the sensation is that aspect which urges to action. It furnishes the basis for the development of *willing.*

Comparison of General and Special Sensations.—The following points in the comparison of general and special sensations are worthy of study:

1. General sensations enable the mind to know the ill-being or well-being of the body; the special, mainly the outside world.

2. General sensations have no special sense organs; the special have.

3. The knowledge got through general sensations is vague, while that obtained through special sensations is much more definite.

4. The emotional aspect predominates in the general sensations; the intellectual, in the special.

5. General sensations have no special brain areas; special have.

Pain, hunger, fatigue and thirst as examples of general sensations give one only a knowledge of the ill-being or well-being of the body. This is the function of the general sensations. Color, odor, sound, flavor and so on, special sensations, give one a knowledge *mainly* of objects in the outside world, though not *wholly.* The mind can also get a knowledge of the body through special sensations.

Any part of the body containing nerves is an organ of general sensation; not so, in regard to the special

sensations. Their organs are the eyes, the ears, the nose, and so on—special organs.

Pain, fatigue, and so on, general sensations, do not give definite knowledge. The knowldege got through them is general and vague. Sound, flavor, odor, and color, special sensations, give definite knowledge.

General sensations are mainly painful or pleasurable. This is the most important thing about them. But the most important thing about the special sensations is their value to the intellect. They enable the mind to get knowledge.

General sensations are not aroused by impulses being carried to special brain areas. Any part of the cortex of the brain seems to be connected with general sensations. Sight sensations, auditory sensations and so on have special brain areas.

Read:

1. Pillsbury's Essentials of Psychology, pp. 60-103.
2. Angell's Psychology, pp. 91-121.
3. Dewey's Psychology, pp. 27-44.

CHAPTER XI.

The Senses.

The Nature of a Sense.—A sense is wholly a *mental thing.* It is not made up of nerve endings, tissues, blood vessels nor cells. It is not a physical thing at all. It is entirely mental. It is a sense which enables the mind to get sensations. The following is the formal statement for it: *A sense is the mind's power to get sensations.* Thus the sense of sight is the mind's power to get sensations of color; the sense of hearing is the mind's power to get sensations of sound; smell, the mind's power to get sensations of odor.

"A sense is not an organ or group of nerve-ends, but a power of the mind. A sense is the mind's power to receive impressions of the outer world by means of a particular set of nerves, or part of the nervous system. For example, the sense of smell is the mind's power to be impressed through the agency of the olfactory nerves and their special connection in the brain."

Classes of Senses.—There are in general two classes of senses:

1. General, or organic.
2. Special.

Pain, hunger, thirst and fatigue are sensations got through the general sense. It will be seen that their function is chiefly to inform one of the ill-being or well-

being of the body; also, that they have no special organs. Any part of the body having nerves is an organ of the general sense. Thus the hands, the eye, the stomach, the heart and the liver are organs of the general sense. The definition of the general sense is as follows:

The general sense is that sense which gives one a knowledge of the ill-being or well-being of the body and has no special organs.

Color, sound, odor, and flavor are sensations got through the special senses. Their functions, it is seen, are mainly to give us knowledge of objects in the outside world. They have special organs. Thus the eye is the organ of color sensation; the ear, of sound sensation; the nose, of odor sensations; and the mouth, of flavor sensations. The definition of a special sense is as follows:

A special sense is that kind of sense which gives us mainly a knowledge of objects around us, and which has special organs.

The Special Senses.—The special senses are seven in number, though not long ago it was thought that there were only five. If they be named accordingly as they give most knowledge during one's whole life under normal conditions, they are as follows:

1. Sight.
2. Hearing.
3. Touch.
4. Smell.
5. Taste.
6. Muscular.
7. Temperature.

The Temperature Sense.—"Next to the organic sense in its generality, is the Thermal, or Temperature Sense, yielding the sensations of heat and cold. This sense was formerly not distinguished from that of touch, for the reason that its nerve ends are distributed through the skin. But experimentation finally established the fact that these sensations arise from the excitation of separate nerve ends devoted to this purpose. Some of these are susceptible only to contacts of relatively high temperature, and are known as *heat spots;* others only to contacts of low temperature, and are known as *cold spots.* These are closely interspersed throughout the skin, but may be located by the use of a metal pencil or needle. If this when heated be touched to a 'cold spot,' only the sensation of contact will be felt; the same will be true if a cold point touches a 'heat spot.' It should be remembered that 'heat and cold are only skin deep.' The temperature of the blood, and consequently of the flesh, does not vary greatly with the changes of atmospheric temperature. The temperature of the blood is confined within the range from 95° t 106° Fahrenheit, the normal temperature being from 97° to 98.5°. Sidney Smith, on a hot day, wished to 'take off his flesh and sit in his bones.' It would have answered as well to take off his skin only."

There are the two following reasons why the temperature sense is to be considered a separate sense from the touch:

1. They have separate nerve fibers and nerve endings.

2. Their delicacy does not vary in the same way over different parts of the body. The tip of the tongue, the ends of the fingers and the lips are most sensitive to touch, while the cheek, not very sensitive to touch, is the most sensitive to temperature.

The Muscular Sense. — The muscular sense and touch are so closely connected that formerly they were not discriminated. And there are some psychologists now who do not regard it as a separate sense. But it is better regarded a separate sense.

There are afferent nerve fibers which have their peripheral ending in the muscles. When the muscles act or are at rest these fibers carry impulses into the brain and there result muscular sensations. *The mental power to get sensations of motion and resistance from sensory nerve fibers having their peripheral ends in the muscles is the muscular sense.*

The chief sensations got through this sense are the sensations of *movement* and *resistance.* Both measure muscular energy which is being put forth. Without the aid of other senses the mind learns muscular movement, its distance and direction; also, the amount of energy put forth in overcoming resistance in any form whatever, weight, hardness, or rigidity.

Ideas Got from Muscular Sense.—Through the various muscular sensations the mind gets ideas of *motion, extension, distance, direction, weight, hardness, softness, rigidity* and *pliability.*

The muscular sense is thus seen to be a very important sense. It gives us the original ideas which furnish

the basis for *geometry* and *physics*. Without the muscular sense our progress in getting acquainted with the external world would be very slow if not impossible.

The Sense of Taste.—Taste is that special sense whose end organs are the taste buds in the tongue. This is a statement for taste in a strict sense. What is usually called taste is really a combination of three senses: taste proper, smell, and touch. It is a common observation that when anything affects the sense of smell, a bad cold, for instance, our food tastes different. And much of the pleasure which comes from eating jellies, ices, etc., is derived from touch and the temperature sense.

There are on the tongue papillae which give the roughness to the tongue, and in these papillae are taste buds. Soluble substances reduced to liquid form soak into these taste buds and stimulate them. From these stimuli there result the sensations of taste.

The distinct tastes are four in number: *sweet, sour, salt,* and *bitter*. There are many combinations of these four. Such so-called tastes as *puckery, pungent,* and *hot* are not regarded by psychologists as tastes, properly speaking. They are called mechanical effects. "All these 'mechanical effects' belong really to the class of organic sensations."

Functions of Taste.—The functions of taste are in general three:

1. It has been called the "sentinel of the stomach."

2. It gives points of knowledge about substances in the external world.

3. It gives us a great deal of pleasure.

The Sense of Smell.—The sense of smell is that special sense whose organ is the nose. Hidden away in the upper cavities of the nose are two small patches of mucous membrane. In these are distributed the olfactory nerves, the nerves of smell. They are affected by gaseous particles of matter coming in contact with them, and there result the odor sensations.

"These nerve ends are extremely sensitive and may be stimulated by inconceivably small portions of matter. It has been calculated that three one hundred millionths of a grain of musk can be distinctly smelled; and a substance called mercaptan can be smelled in still more minute quantities."

Odors are many in number but they do not have definite names. They are usually grouped as:

1. Agreeable.
2. Disagreeable.

These terms are not definite in meaning, but very vague.

The effects of ammonia, horse-radish, pepper, snuff, and dust are not considered as sensations of smell, properly speaking. They more properly belong to the organic sense.

Functions of Smell.—The functions of smell are similar to those of taste. They are three in number.

1. Smell is a sentinel to the stomach and the respiratory organs.

2. Smell gives us ideas of many substances in the external world.

3. Smell gives us a great deal of pleasure.

"*Confusion of Taste and Smell.*—The confusion of taste and smell is a very common experience. Many substances, as fruits and cakes or confectionery containing certain 'flavoring extracts,' as vanilla, peppermint, etc., when taken into the mouth and subjected to its heat and moisture and the process of chewing, give off vapors which rise from the pharynx into the upper cavities of the nose and produce sensations of smell. These, occurring in such close connection with real sensations of taste, are not discriminated from them, and all go in as 'taste.' The so-called cooking extracts have no true tastes, but only their respective odors and certain mechanical effects due to the alcohol which they contain. The taste of onions is sweetish, where any exists; their chief characteristic, even in the mouth, being their odor and the 'strong' mechanical effect. If the nasal passages be properly obstructed, one can not distinguish by taste alone peppermint or wintergreen lozenges from each other or from those without any 'flavoring' element."

The Sense of Touch.—Touch is that one of the special senses which gives sensations of contact and pressure. The sense organs of touch are distributed through the layers of the skin. There are several forms of these. These are special endings of afferent nerve fibers, and some of them are quite complex. There are the following of these organs:

1. Touch cells.
2. Pacinian corpuscles.
3. Tactile corpuscles.
4. End bulbs.

The organs of touch are more numerous or more sensitive in some parts of the skin than in other parts. The tip of the tongue, the lips, and the finger tips are most sensitive, while the thigh or mid dorsol region is least sensitive. The finger tips of the blind become most wonderfully sensitive, since they have to depend upon them largely for their knowledge of the external world.

Strictly speaking the sensations of touch are only those of *contact* and *pressure*. Pressure by some authorities is considered intensity of contact.

Functions of Touch.—The functions of touch are in general of two classes:

1. Pleasure-giving.
2. Knowledge-giving.

The sensations of smoothness and softness are pleasurable. They are especially so when combined as in velvet, or the human skin. Dust and sand give pleasant sensations to the feet and hands of children. Roughness and hardness when combined into harshness are on the other hand, disagreeable.

The knowledge-giving function of touch is by far its most important function. Along with the muscular sense it gives us our most fundamental ideas of the material world.

"Thus we derive from contact, first, the idea of *extension,* and thus also of superficial form. This comes

from what is known as 'plurality of points,' that is through the number of points of stimulation, or of nerve ends excited. The idea of motion may also be derived from the succession of stimulated points, as when we draw a pencil point across the skin, or in the progress of a fly or other creeping thing across the cuticle. From plurality of points, we also derive ideas of *surface,* as *roughness, smoothness,* the rough surface being that in which the projecting points are relatively few and far apart, as in a rough-plastered wall contrasted with a polished surface. Some idea of weight may also be derived, as when a weight is placed on the back of a hand supported by a table.''

The Local Sign of Tactile Sensations.—It will be remembered that local sign of touch sensations is *that characteristic of them which enables the mind to know the point of application of the stimulus.* Thus the mind knows pretty well just where the stimulus is applied on the skin or at how many points on the skin. This enables the mind to tell the *form* and *size* of objects.

''The accuracy of this localizing power varies greatly with different areas of the skin. This may be tested by touching the skin at two points simultaneously, as with the points of a pair of compasses or scissors, and noting the distance between them necessary to produce a consciousness of two contacts. This distance is least on the tip of the tongue, where it is only four-hundredths of an inch, whereas, on the middle of the back the points must be over two inches apart in order to be distinguished as two.''

Thus touch gives the following ideas: *extension, roughness, smoothness, weight, form, distance, motion* and *size.*

"The value and importance of active touch is emphasized by the fact that it is so often employed as a court of appeal from the other senses. 'There are ghosts to all senses but one;' but whatever seems real to the touch has met the supreme test of reality. 'Let me take hold of it,' is our demand when we distrust our other senses."

The Sense of Hearing.—The sense of hearing is that special sense which gives sensations of sound. The sense organ of hearing is the ear. The ear is a very complicated organ consisting mainly of cavities, canals, fluids and membranes. In these are distributed the ends of the fibers of the auditory nerves.

The stimuli of hearing under ordinary conditions are *waves,* or *vibrations, of the air.* These vibrations are produced by some vibrating body.

These waves of the air disturb the ends of the auditory nerves and set up impulses which result in sensations of sound.

Classes of Sound.—Sounds are of two classes:

1. Noises.
2. Tones.

Tones are sounds produced by regularity of vibration of the air. Noises are sounds produced by irregularity of vibration in the air.

Characteristics of Tones.—The characteristics of tones are three:

1. Pitch.
2. Intensity.
3. Timbre, or quality.

Pitch, which is ordinarily called *highness* or *lowness,* of sound is due to the rapidity of vibration. A sound of the human voice produced by the vibration of the vocal cords at the rate of 100 per second is very low; one produced by the vocal cords vibrating at the rate of 700 times per second is very high.

The range of the human voice is from eighty-seven to 768 vibrations per second ordinarily, though a famous singer's voice is said to have reached a height of 1,365 per second.

The ears of most persons are capable of responding to vibrations so as to hear only between thirty and 36,000 vibrations per second. But in rare instances sounds are heard produced by from sixteen to 40,000 vibrations per second.

The middle C of the musical scale is produced by a rate of 256 vibrations per second.

Intensity of sound is usually called *loudness* or *softness* of sound. It results from the *amplitude* of the vibrations in the air. The amplitude of vibration has reference to the distance through which the vibrating medium swings. Thus if one vibrating string swings through a space of six inches and another swings through a space of twelve inches, the amplitude of the vibrations of the air produced by the second is greater than those produced by the first. Thus the *amplitude,*

or breadth, of the sound waves determines the intensity of the sound.

Timbre, or *quality,* of tone is that characteristic which enables the mind to tell tones of the same pitch and intensity one from another, as the tone of one friend's voice from another, the song of the robin from the song of the thrush, the song of the oriole from the song of the cat bird, the music of the fiddle from the music of the mandolin, or of the flute from the bagpipe. It is said that the difference in quality is due to difference in *overtones.*

Functions of Hearing.—The functions of hearing are in general of two kinds:

1. Pleasure-giving.
2. Knowledge-giving.

The chief pleasure-giving value is to be found in music. Music charms, soothes, and delights the mind of everyone from the infant to the most aged.

In addition to *pitch, intensity,* and *quality* of sound the mind gets *harmony, distance,* and *direction* through hearing. These when associated with objects give the mind a great deal of knowledge concerning objects in the external world.

The Sense of Sight.—Sight has been called the *king* of the senses. Its wonderful range and its constant use during all of one's waking hours properly give it this high position.

Sight is that one of the special senses which gives sensations of light and shade.

Organ of Sight.—The eye is the organ of sight.

"The organ of sight is a seemingly more simple but no less wonderful instrument than the organ of hearing. The enclosing envelope, or eyeball, consists of three coats or layers. The outer, called the Sclerotic coat, is a tough white membrane, which encloses the eye except in front, where the transparent cornea takes its place, like the crystal of a watch set in its case. Next within is the Choriod coat, a thin, black coat of great delicacy. In front, it is modified into the curtain called the Iris, the circular opening in which is called the Pupil. The iris contains certain muscles by the contraction of which the pupil may be dilated or contracted. The third or inner coat, called the Retina, covers only the back portion of the eyeball, having the form of a cup or bowl."

The space inside these coats is filled up with humors and lenses. 1. Just back of the cornea is a watery fluid called the *Aqueous Humor*. 2. Just behind this humor is the Crystalline Lens, "a double convex lens of a jelly-like substance having considerable elasticity and enclosed in a capsule attached to the Suspensory Ligament." 3. Between the crystalline lens and the retina is the Vitreous Humor, a semifluid substance.

Stimulus of Sight.—The stimulus of sight is vibrations of *ether*. Ether is a medium which pervades all space. The vibrations of ether enter the eye in rays, or lines, of light. The waves of these rays are many in number per second ranging from 462 trillions to 733 trillions.

These rays of light pass into the eye and stimulate

the retina from which result the sensations of *light* and *shade.*

Accommodation.—In order that rays of light may be focused upon the surface of the retina so as to form a correct image, means of adjusting the crystalline lens are provided. If the object to be seen is close to the eye the lens must be more convex than if it is at a distance. This adjustment of the lens to suit the eye to the distance of the object is called *Accommodation.*

In order that the student may understand accommodation, it is absolutely necessary that he have well in mind the position of the parts of the eye. Having these in mind he can understand the following explanations: "In a state of rest the front of the lens is kept somewhat flattened by the suspensory ligament, which is attached to the crystalline lens and to the ciliary processes. The ciliary processes are attached to the ciliary muscle, which is itself firmly attached to the point of junction of the cornea and sclerotic. When the ciliary muscles contract the ciliary processes are pulled forward. This loosens the suspensory ligament, and the crystalline lens by its own elasticity becomes more convex. The strain felt in looking at an object very near to the eye is the muscular feeling due to the contraction of the ciliary muscle."—Dexter and Garlick.

"How does the lens change its curvature? The crystalline lens is elastic, that is, if its surface be made flatter by pressure, it recovers its original curvature and shape when the pressure is removed. We have seen that the lens is kept in its place by the suspensory ligament

passing off from its edge to the ciliary processes all around it. The lens itself is enclosed by a transparent membrane, thicker in front than behind, called the capsule of the lens. It is to this capsule that the suspensory ligament is attached, but the suspensory ligament not only joins the capsule at the edge of the lens, but becomes directly contiuuous with the part of the capsule covering the front of the lens. This ligament is naturally tight, so that it is always more or less compressing the front of the lens, making this surface less convex than it would otherwise be. When we are looking at distant objects the pressure of the suspensory ligament is reducing the curvature of the front surface of the lens as much as possible, so as to make the lens weak. In this condition also is the lens when the eye is at rest, as during sleep. From the junction of the cornea and sclerotic there are fine unstriated muscle fibers passing downward into the ciliary processes. These form a continuous ring of delicate muscle, called the *ciliary muscle.* When this muscle contracts, the ciliary processes with the loosely-attached choroid are drawn upwards towards the origin of the muscle from the junction of the firm and immovable sclerotic and cornea. As the ciliary processes are moved they carry with them the attachment of the suspensory ligament up nearer to the lens; thus the whole suspensory ligament is slackened. When we look at a near object this muscle contracts, and so slackens the suspensory ligament, and the lens, the pressure on its anterior surface being lessened, becomes by its own elasticity more convex.''—Foster and Shore.

External Muscles of the Eye.—The eyeball must be turned in various positions in seeing. There are six muscles attached to the eyeball on the outside: four straight muscles, called *Recti,* and two oblique muscles, called *Obliqui.* The *recti* move the eyeball up and down and to the right and left. The *obliqui* run through loops which act as pulleys and move the eyes in directions between those produced by the *recti.*

These muscles are important psychologically in that sensations from them help sight in furnishing material for various kinds of ideas.

The Unaided Office of the Eye.—In adult life we get so much of our knowledge through the sense of sight, that we are likely at first thought to overestimate its original power. Though in adult life we get ideas of distance, direction, size, form, roughness, smoothness, hardness, softness, heat and cold, not one of these ideas came to the mind originally through sight. Originally sight gives but three things:

1. Colors.
2. Combination of colors.
3. Intensity of light.

Mr. Dewey calls these three things (1) *hue,* (2) *tint,* and (3) *intensity.*

"A man who had never seen until he was thirty years old has sent to *The Problem,* a magazine for the blind, a remarkable account of his experience when the bandage was drawn from his eyes in the hospital, and he was, as it were, born again into the world.

What I saw frightened me, it was so big and

made such strange emotions I called out in terror and put out my hand. My fingers touched my nurse's face. I knew she was there, for she had just taken the bandages from my eyes, and I knew what I was touching, but I did not know what it was I saw.

'For mercy sake, what is it?' I asked. The nurse answered me soothingly, taking my fingers in her hand and moving them from her mouth to her eyes, to her nose, chin and forehead.

'It is my face that you see. Look! You know this is my mouth—my chin—and these are my eyes.'

Soon I knew that I was seeing what was familiar to the touch of my fingers—a human face. But the sensation was still one of terror. I seemed so small beside that expanse of human features which was so familiar to my fingers, so unnatural to my new sense.

When the nurse moved away from my cot, I felt a new sensation, which was so agreeable that I laughed aloud. The nurse came back, but not so close as before.

'What is that?' I asked.

'You are looking at the blanket which lies across your feet,' she said.

'Blankets must be very beautiful things,' I said.

'It is a red blanket,' she explained.

Then I thought I knew why people spoke of the beauty of the red rose. This was my first knowledge of colors.

I saw and yet I did not know that I saw. How could I know at first that those new and wonderful sensations meant the birth of a sense of which I knew noth-

ing except in theory? Of course I was expecting to see, but was this sight—this jumble of extraordinary sensations?

The dazzling light first convinced me, for I had always been able to distinguish between night and day. But I could not recognize objects with my new-found sense until I had translated into its speech the language of the other senses.

The one lesson of the blanket was sufficient to teach me the color, red. Yellow was a different matter. The nurse brought me a cool drink. I could recognize her by sight now. The thing I saw in her hand I knew to be a tray after I had felt it. Suddenly I felt a thrill of disgust.

'What is that thing on the tray?' I asked. 'It makes me sick.'

'It is a lemon. You said you liked lemonade.'

'Then it is yellow. It is the color that nauseates me.'

Any object close to me looked tremendously large. I had often romped with children, yet when I first set eyes on a baby it looked gigantic.

The first day I sat by the window I put my hand out to feel the pavement.

'That must be the pavement,' I said. 'I'm going to feel of it to make sure.'

'My goodness!' laughed the nurse. 'The pavement is two stories below.'

The first meal I ate was an odd experience. When

I saw the great hand with a huge fork approaching my mouth, the inclination to dodge was almost irresistible."

Read:

1. Dewey's Psychology, pp. 50-75.
2. Halleck's Psychology, pp. 29-40.

CHAPTER XII.

Sense-perception.

The Development of Knowing.—The most helpful way to study knowing is to study its development because in this way the mind sees how the different elements to be studied in knowing have come into existence, how they change and are succeeded by new products.

But at once we are confronted with the question, What does the development of knowing consist of? And to answer this question, it is necessary to rethink what knowing is. This was defined in a previous study as follows:

Knowing is the mind's process of grasping the relation between its experiences. So, in brief, all knowing is a process of *grasping relations.* This is true whether it be the simplest kind of knowing of the little child or whether it be the highest kind of knowing of the most profound thinker.

Illustration.—One finds a peculiar looking plant growing in a pasture. He knows it is a plant because the experiences which it arouses in his mind are related to the experiences which plants have aroused in his mind before, but beyond knowing it is a plant, he is not aware of having any knowledge concerning it. What kind of roots, what kind of blossoms, what kind of fruit it produces, he does not know. Whether it is benef-

icent in its connection with man or whether it is injurious he does not know. If we should ask him why he does not know these things, he will say something which in substance will mean he lacks experience with the plant. But one may learn to know all these things and the learning will be seeing the plant in its relations. So it looks as if knowing is seeing the relations between outside objects in this case. But scientifically speaking the mind can not do such a thing. The mind is mental and can deal with only mental things; that is, with mental experiences. Knowing the plant is then grasping the relations between the experiences the mind is stimulated to, by these various things in connection with the plant.

Knowing is then getting relations between our experiences and relations are in the mind only. They are the connections between our mental experiences.

If few relations are grasped the knowing is little developed, but if many relations are grasped the knowing is much developed, and so gaining in ability to get relation is one thing the development of knowing consists of.

Not all the knowledge one has of anything is of equal importance, and so not all relations grasped are of equal importance. Some are of little importance and some are of much importance.

To know that the toad is a homely creature is not as important as to know that he is one of man's best animal friends. To know that the three-leaved ivy vines is not as important as to know that it is a most dangerous

poisonous plant. To know that malaria causes chills is not as important as to know that it is caused by a little animal living in the red blood corpuscles.

An important thing in knowing then, is to distinguish between important and unimportant relations and that knowing which does so is more developed than that which does not. Also, that knowing which distinguishes to a large degree between the important relations and the unimportant ones is more developed than that knowing which distinguishes between the important and unimportant relations to a small degree.

A second thing thus that the development of knowing consists of is gaining in ability to distinguish between important and unimportant relations.

Though one could both get more and more relations and distinguish between the important and unimportant ones and yet was very slow in doing these things something would be lacking. And one who can do these two things readily is evidently a more developed knower, other things equal, than one who cannot.

From this study it appears that the development of knowing consists of the following three things:

1. Increasing ability to grasp more and more relations.

2. Increasing ability to distinguish between the important and unimportant relations.

3. Increasing ability to do "1" and "2" easily and readily.

So to show that one kind of knowing is more developed than another, one must show that the mind in it

does one or more of these three things to a greater degree than in the other.

Stages in the Development of Knowing.—In its growth from the lowest to the highest kind of knowing the mind manifests its activities in fairly well marked stages. These stages are named from the predominant element in the activity and are as follows:

1. Sense-perception.
2. Memory.
3. Imagination.
4. Conception.
5. Definition.
6. Judgment.
7. Reasoning.
8. Systematization.
9. Intuition.

Sense-perception is the least developed kind of knowing and intuition is the most highly developed kind.

Sense-perception.—This as the term indicates is perception of objects through the senses. The term *sense-perception* is frequently used by authors to mean the same as the term *perception.* This should not be done, as the term *perception* is a term of broader application than the term *sense-perception.* Perception may be the perception of what is going on in one's own mind; that is, *inner perception,* or it may be the perception of material objects; that is, *outer perception.* Inner perception is simply *introspection,* previously studied. Outer perception is sense-perception, the subject of study in this chapter. Perception includes both introspection and

sense-perception. To use the terms interchangeably is not scientifically accurate.

The term perception is also used in a kind of popular sense to mean almost any kind of knowing. One says he perceives the force of an argument, when he means he comprehends it. Or he says he perceives the gravity of a situation, when he means he understands it. Or, again, he perceives the humor of a joke. This general vague use of the term is its popular use and not the sense in which it is used in psychology.

In these studies the term is used to mean the process of getting a knowledge of material objects through the senses—its scientific use.

Really the only way to understand sense-perception perfectly well is to trace through the process, step by step, of the mind in the act of sense-perception.

We look at a flower and know it is a carnation. The act is one of sense-perception. We of course do not get the material carnation in mind. That is a psychological and physical impossibility. We say we get the idea of the carnation in mind, and in general this is right. But there is no such thing as an idea getting out of the carnation and in some mysterious way getting over into our minds. The mind of course is mental and deals only with mental things.

The only thing which one actually receives from the carnation is some rays of light reflected by it. These strike the retina of the eye and disturb it, this disturbance spreads, reaches the brain, disturbs it and results in a *group* of sensations. A complex object always

is the stimulus for a group of sensations, not a single sensation. This group of sensations is like a group of sensations which the mind has had in the past when it was informed it was experiencing a carnation, may be many times in the past when it understood it was experiencing carnations. The mind sees, either consciously or unconsciously, the likeness between the present group of sensations and the past group of sensations and infers the object is a carnation. This is the process of the mind in *sense-perception.*

Again we listen to a bird's song and know the bird is an oriole. The act is one of sense-perception.

All that comes to one in this case is some motion in the air produced by the activity of the bird in singing. The motion comes into the ear and affects the ends of the auditory nerve; this disturbance spreads to the brain, and produces a disturbance there and results in a group of sensations. This group of sensations is like a group of sensations the mind has experienced in the past, probably many times, when it understood it was experiencing the activity corresponding to the oriole. The mind grasps, consciously or unconsciously, the likeness between the present group of sensations and the past group and infers that the bird is an oriole. This again is the process of the mind in sense-perception.

If one both sees and hears some object, as a bird, there goes on sense-perception through two senses, sight and hearing.

The process in sense-perceiving some objects

through smell, taste and touch is similar to that in the case of sight or hearing.

The process of seeing the likeness and difference between a present group of sensations and a past group of sensations and referring them to some object is called *interpreting the sensations,* and this, interpreting the sensations is the *sine qua non* of sense perception. There is no sense-perception without it.

Induction from the above cases of sense-perception gives the following definitions of sense-perception:

Sense-perception is the mental process of interpreting the sensations corresponding to some external object.

Sense-perception is that stage in the development of knowing in which the mind interprets the sensations corresponding to some external object.

The Object of Sense Perception.—In the discussion above the carnation and the oriole were the objects sense-perceived. These objects were particular objects; they were material objects, they were external to the mind, they were present in time and space and the presumption was they were not known to have been known before.

Suppose one should have a rose placed under his nose, he being blindfolded, and from the odor the mind would know that the object is a rose. The mental activity would be a case of sense-perception. The object again is particular, material, external, present in time and space and not known to have been known before.

From these several examples the conclusion is that

the object with which sense-perception deals has the following characteristics:

1. Particular.
2. Material.
3. External.
4. Present in time and space.
5. Not known to have been known before.

Particular.—That which makes an object particular is that which enables the mind to know it from all other things. It is differences which enables the mind to do this. A particular object is thus an object known from all other things.

Material.—To the mind that is material which makes possible sensations of resistance, or occupies space. But the mind can know that the object occupies space only because it stimulates to sensations of resistance. The material object thus is one that stimulates to sensations of resistance.

External.—The external object is an object outside the mind, not necessarily external to the body. One may perceive parts of his own body.

Present in Time and Space.—The quantity of time actually present is unconceivably small, so the term *present time* as usually used has reference to a present period of time. In this sense to-day is present; this minute is present; this hour is present. This century is called the present century. But the present period is always found to be measured by some event, as the year by the time it takes the earth to swing around the sun. So when it is said the object is present in time the mean-

ing is that the object and the act of *sense-perceiving co-exist,* exist at the same time.

The quantity of space one can actually call present is also very relative. It may be very small or it may be very large. An object may be present to one sense and not present to another. One may hear a friend speaking in the next room, but not be able to see the friend. The friend is present to hearing but not present to sight. One may see the sun, some 92,000,000 miles away, but he can not hear, touch, taste, or smell it. It is present to sight, but not present to any of the other senses. One may see a star so far away that it takes the light 2500 years to come from it to the eye, traveling at the rate of 186,000 miles per second. The star is present to sight but not to the other senses. An object then is present in space when in such a positiion as to be *a stimulus to any of the senses.*

Not Known to Have Been Known Before.—If the object is known to have been known before either popularly or scientifically one would say he remembers it. So *known to have been known before* is an element of memory but not an element of sense-perception. If one knows he has known the object before, it seems right to say it may be a case of sense-perception to the place where this element comes in, but at that place it shades into memory.

Relation of Sensation to Object.—In sense-perception the sensation always is referred to the object as an attribute of the object, and the object is made up of the total of its attributes. The odor of clover, the flavor of

the orange, the scarlet of the poppy are all sensations—mental things—though the mind in sense-perception regards them as real attributes of the objects. This is only another aspect of the truth so often seen that the mind is mental and can deal only with mental things.

Classes of Sense-perception on Basis of Sense Involved.—One sees a flower and knows it is a rose, a case of *visual* sense-perception; he hears a bird and knows it is a lark, a case of *auditory* sense-perception; he touches an animal and knows it is his dog, a case of *tactual* sense-perception; he smells a flower and knows it is a pansy, an instance of *olfactory* sense-perception; he tastes a fruit and knows it is a strawberry, an instance of *gustatory* sense-perception; he comes in contact with an object and knows it is cold, an instance of *temperature* sense-perception; he lifts an object and knows it is heavy, an instance of *muscular* sense-perception.

So on the basis of the sense involved, there are the following classes of sense-perception: 1. Visual. 2. Auditory. 3. Tactual. 4. Olfactory. 5. Gustatory. 6. Temperature. 7. Muscular.

Visual Sense-perception.—Visual sense-perception is so important in adult life that one is likely to overestimate its original importance. We in adult life know size, distance, direction, form, temperature, roughness, smoothness, hardness, softness, odor, flavor, weight, etc. of objects, as well as what they are, through sight, but scarcely think that all these things have been transferred to visual sense-perception from some other kind of sense-perception. But such is the case. At first visual sense-

perception gives us only (1) *color,* (2) *combinations of color,* and (3) *intensities of light of objects.* As said before some authors call these: 1. Hue. 2. Tint. 3. Intensity.

By combining and associating these three things sight learns to construct its *field of vision.*

The Field of Vision.—"When a surgical operation has enabled the blind to see, they have invariably at first declared that objects either touched their eyes or were at no definite distance from them. A landscape with a hill and a forest in the background, a pasture with cattle and sheep, a brook with a growth of willows and a white farmhouse in the foreground, were first seen only as blotches of color touching the eye."

Visual sense-perception learns from several things how to construct a field of vision, that is, how to sense-perceive objects.

1. By the size of the retinal image, since it varies with the distance of the object. If men at work in a field look to be only about two feet high, the mind, since it knows the size of an average man, thinks they must be a considerable distance away.

> "The fishermen, that walk upon the beach
> Appear like mice."

2. The mind estimates distance by the intensity of light. More light comes to the eye when the object is close and less when the object is far away, other things equal. So a lighter shade is a sign of a closer object and a darker one a sign of a more distant object. Also

the outline of the distant object is dim and of a near one sharp.

The painter by manipulating shades and outlines gives the idea of perspective on canvas.

3. The mind estimates distance and size by the intervening objects. One used to estimating distance on land is almost certain to underestimate distance on water or a plain when there are no intervening objects. A common instance of this is the way most people misjudge the width of a river.

4. The motion of objects across the field of vision helps visual sense-perception. In case of turning the eyes to right or left, up or down, objects far apart afar off require less motion of the eyes than objects far apart nearer.

Also in riding past objects, those near at hand pass from sight quickly and those far off much more slowly.

5. The muscles of the eye furnish data, too, which helps visual sense-perception. The eye must be focused differently in looking at objects near and far and the muscular activity helps the mind in estimating distance and size.

Auditory Sense-perception. — Auditory sense-perception is the process of interpreting sensations of sound. One hears sounds caused by a violin, a piano, a bell, a dog, a cow, a grasshopper, a cricket or robin, interprets them and knows the object which produces the stimulus. All such are instances of auditory sense-perception.

By auditory sense-perception we do the following:

1. Locate, to some extent, the object producing the stimulus.

2. Refer the sound to the characteristic object producing the stimulus.

The mind tells the distance and direction of the stimulus producing object by (1) intensity of the sound, (2) the quality of the sound and (3) by the direction of the approaching sound wave.

The intensity of the sound varies with distance the sound waves travel. A report of a cannon is not so intense when five miles away as when one mile away.

The quality of the sound is changed, too, by the distance the sound waves travel. A flute produces a sound different in quality when near at hand and when one-half mile away.

If the line of the approaching sound wave be from the front, from the right, left or back, it will in each case result in sounds that differ a little in quality. This furnishes the mind signs which enables it to know something of direction.

Accuracy of Auditory Sense-perception.—Auditory sense-perception is not as accurate as popularly thought. Many mistakes both as to distance and direction are made. Some experiments seem to show that as many as forty cases in a hundred were in error as to direction, and almost all cases more or less in error as to distance.

The ventriloquist deceives in every way, (1) as to the character of the object producing the stimulus, (2) as to distance, and (3) as to direction. He produces the sound the object would naturally occasion if it were

what it seems to be and were where it seems to be. His art consists in doing this.

The mind knows the character of the object occasioning the sound by the quality of the sound. The mind thus knows a friend by his voice, the thrush by his song, the horse by his neigh, the cow by her low, the storm by its roar, etc. It makes mistakes though here, too, quite often.

Tactile Sense-perception.—Tactile sense-perception is the process of interpreting sensations of touch. In the dark we put our hands on a chair, the table, a book, the stove, a hat, or the door, and the mind knows the object in each case, and each case is an instance of tactile sense-perception.

Tactile sense-perception is the most fundamental kind of sense-perception and the hardest kind to deceive. We may think we see and hear something, but when we put out our hands and touch nothing, we decide sight and hearing were in error, and that touch is right.

From the sensations of *contact* and *pressure,* the purely tactile sensations, the mind learns the *extensions, roughness, smoothness, weight, form, distance, motion* and *size* of objects. And from these signs it readily knows what the objects possessing these characteristics are.

Touch sense-perception is capable of improvement by cultivation. This is readily seen in the case of the blind who learn to read by touch, to do fancy work and even to understand one who is speaking to them, when both deaf and blind, by placing their fingers on one's vocal organs.

Olfactory Sense-perception. — Olfactory sense-perception is the process of interpreting the sensation of smell. The odor of the rose, of the violet, of the clover or linden, of coffee, of the codfish, of the cocoa, or the strawberries enables the mind to know these objects by these sensations alone. Each case of such knowing is an instance of olfactory sense-perception.

Olfactory sense-perception is better developed in many of the lower animals than in man. The dog will track, by olfactory sense-perception, his master along the crowded streets of a city hours after the master has passed that way.

Olfactory sense-perception is capable of cultivation to a rather high degree. The following quotation will show something of this:

"Dr. Howe, in the *Forty-third Report of the Massachusetts Asylum for the Blind,* is authority for the statement that Julia Brace, a deaf and blind mute, could instantly recognize a person she had met before as soon as she caught the odor from his glove or hand. This sightless girl was actually employed to sort all the clothing of pupils after it came from the wash. Her power of smell, in definiteness and vividness must have surpassed the sense of sight in most persons."

Gustatory Sense-perception.—Gustatory sense-perception is the process of interpreting the sensations of taste. Knowing chicken, beef, mutton, an apple, a peach, a cherry, or an onion by taste is in each instance gustatory sense-perception.

The extent to which gustatory sense-perception is

capable of cultivation may be known from the skill of wine tasters and tea tasters. Mr. Taylor in his genetic psychology says that tea tasters become so skillful that one may mix fifty kinds of tea together, steep some of the mixture and the tea taster by tasting will correctly tell the different teas mixed. Wine tasters become equally skillful and some have been known "who could tell under what latitude a wine was produced as accurately as an astronomer can predict an eclipse."

Temperature Sense-perception.—This is the process of interpreting sensations of heat and cold. This kind of sense-perception is usually combined with tactile sense-perception and seldom, if ever enables one to know an object merely by itself. It enables the mind to know objects as hot or cold.

Muscular Sense-perception. — Muscular sense-perception is the process of interpreting muscular sensations. Muscular sense-perception is usually combined with tactual sense-perception, but probably not to as large a degree as temperature sense-perception. The chief muscular sensations are those of *movement* and *resistance.* By a combination of these the mind learns the *motion, extension, distance, direction, weight, hardness, softness, rigidity* and *pliability* of objects.

Classes of Sense-perception on Basis of Development.—We look at a table and say it is rough or smooth. The knowledge that the table is rough or smooth is gained by the way it looks; that is, through visual sense-perception. But this knowledge could not have been gained at one time through visual sense-perception. It

could have been obtained through only tactile sense-perception. There thus appear two kinds of sense-perception which may be used in knowing the table is rough or smooth.

Again, if one learns that a piece of red-hot iron is hot by placing his hand upon it, he gets his knowledge through the temperature sense, the only way there is of directly getting such knowledge. At first, sight could not give such knowledge, but later the mind would know that the iron is hot through sight. Here again two kinds of sense-perception may be used in knowing the iron is hot.

In the first case the sense-perception was transferred from tactile sense-perception to visual sense-perception, and in the second case, from temperature sense-perception to visual sense-perception. The first kind of sense-perception is original sense-perception and the second kind is transferred sense-perception.

Thus on the basis of development there are two classes of sense-perception:

1. Original.
2. Transferred.

The following definitions grow out of the above study:

Original sense-perception is that kind of sense-perception in which the mind interprets the sensations from one sense without the aid of the sensations from any other sense.

Transferred sense-perception is that kind of sense-perception in which the mind interprets the sensations

from one sense by means of the sensations from some other sense.

If one learns that the iron is hot by touching it, the mind interprets the sensations from the temperature-sense—one sense—only. The sense-perception is *original.*

If one learns that the table is rough by looking at it, the mind interprets the sight sensations by means of touch sensations, and the sense-perception is *transferred.* It has been transferred from touch to sight.

Value of Transferred Sense-perception.—The mind tries to economize in its work. So when it can save time or energy, or when it is more valuable or convenient, the mind transfers the sense-perception from one sense to another. We tell whether a watermelon is ripe by tapping on it. The physician tells whether the patient has pneumonia by listening to the sound made by the air passing through the patient's lungs. It is more convenient and valuable to use transferred sense-perception in these cases.

Reasoning in Sense-perception.—In sense-perception the mind *always classifies* the object which it perceives; that is, thinks it into some known class. But to think the object into some known class requires reasoning.

Reasoning, briefly, is comparing two ideas through the medium of a third. Thus *a* equals *y; b* equals *y;* therefore, *a* equals *b.*

The mind sees an object and knows it as a rose, a case of visual sense-perception. The mind thinks the

object into the class rose; that is, classifies the object. And the following is the reasoning.

This object has stamens united to the top of the calyx tube.

The rose has stamens united to the top of the calyx tube.

This object is a rose.

The Products of Sense-perception.—Sense-perception is a process and every process produces some sort of product or products. Sense-perception produces three: 1. The *percept*. 2. The *illusion*. 3. *Hallucination.*

The Percept.—One can not get the object he sense-perceives in mind, because the mind is mental and the object is material. But he does get something in mind which corresponds to the object, and this mental thing is the percept. This percept is an *idea*. But what is an idea?

Perhaps no term in the English language is used in a wider and vaguer sense than the term, *idea*. Men say they have an idea of the universe, an idea of the solar system, an idea of Mohammedanism, an idea on the tariff, an idea of truth, an idea of emigration, an idea of a horse, an idea of a mosquito, an idea of a cell, an idea of the nucleus of the cell, an idea of a molecule, an idea of an ion, an idea of an atom, an idea of an electron, etc. So it seems that the term, idea, is a symbol for almost any mental thing as a whole, but it is always a unit; that is, the smallest mental product. From the above study the following definition of an idea is reached:

An idea is the smallest mental product corresponding to a thing as a whole.

The percept is a mental thing, an *idea*. It is the idea reached by sense-perception.

The idea of the object we perceive is the percept, the idea of the particular rose, of the particular tree, animal, house or man. The following defines it:

A percept is an idea of a particular, material object present in time and space.

The Illusion.—The mind thinks some times that it has a percept, but the mental product does not correspond with what seems to furnish the stimulus which occasions the sensations. Thus one thinks he sees two objects, when there is but one, or he thinks he sees the color green when he should see the color red.

Or again one thinks he sees a wild animal when it is only a bunch of dried grass, or is sure he has seen a friend pass, as some one passed, when the friend was miles away.

In each instance one has an illusion; that is, he has a mental something in mind, he thinks it is a percept, but the supposed percept does not correspond with the external object. At the time the mind is deceived.

A conclusion from the above study gives the following definition for an illusion:

An illusion is a mental product which the mind thinks is a percept, but which does not correspond with the external object.

Illusions are of two kinds, those in which the sense organs are at fault, and those in which the mind is at

fault. If an object appears double, the sense organ is at fault, but if a curtain is taken for a ghost or a robber, the mind is at fault. If red looks green, the sense organ is at fault, but if a stump is taken for a dog, the mind is at fault. There are thus illusions of two classes:

1. Illusions of the senses.
2. Misinterpretations.

All cases of what is called color blindness are illusions of the senses. These illusions are due usually to some abnormal condition of the nerves of the sense organs. They are of importance in rail-roading, in manufacturing, and signaling.

All cases of mistaking objects in haste are cases of illusion by misinterpretation. A man saw a sheep which was eating the grass from around a grave rise up and look at him and was sure at first that he saw a ghost.

Another saw a stump in the dark giving off a phosphorescent glow and was certain he had met Satan.

There are many common illusions of this kind. They are most numerous among the ignorant and superstitious, but not confined to them by any means. These are the illusions with which the magician mostly deceives his auditors.

Many most amusing and ludicrous mistakes are the result of illusions by misinterpretation.

Hallucinations.—These are the most deceptive results of sense-perception. In illusions some sort of object is always present, but in hallucinations no external object is present at all. Good people have heard things when there was nothing to hear; and good people have

seen things when there was nothing to see, and no one is able in some of these cases to convince the person of his error.

It is recorded that Martin Luther, when detained in a castle by his friends, saw the Devil tempting him and threw his inkstand at Him, broke it on the facing of the door and bespattered the wall with ink. Martin Luther is said to have always believed he saw the Devil. Scientists think it was merely an hallucination.

Many cases of visions, miracles, telepathic communications, revelations, etc., have been in all probability nothing but hallucinations. The following is the formal definition:

An hallucination is a mental product which is regarded as a percept by the mind, but which has no corresponding external object.

All classes of people are subject to hallucinations, but the ignorant, sentimental, superstitious, nervous, impulsive and unhealthy seem more subject to them than others.

By some authors hallucination is treated as a class of illusion, and there are good reasons for so doing, and by others it is described as somewhat distinct from the illusion. The present studies treat it the latter way. It is thought a little more helpful.

"In distinction from illusion, which is essentially perception, (i.e., a consciousness of particular material things present to sense—though other things than those really perceived happen to be present), hallucination is the name given to the consciousness of objects felt to be

physically present, when as a matter of fact no object of any kind is at hand."—Angell.

"Hallucinations are closely related to illusions. Hallucinations have a slighter basis in sensation than illusion, and derive more from association."—Pillsbury.

"There are illusive perceptions due to no present external cause. These internally originated illusions are often called hallucinations."—Halleck.

Sense-perception and Apperception. — Many students have some difficulty because of confusion of the meaning of these terms; also, some writers, it seems.

Apperception, it is to be remembered, is an attribute of the mind and sense-perception a stage in the development of knowing. Apperception enables the mind to bring the past experience to bear upon the present experience, and the present experience may be one of knowing, feeling or willing. There could be no sense-perception, memory or any other kind of knowing without apperception, attention, consciousness, etc.; that is, without mental attributes. And attributes are more fundamental than knowing, feeling and willing. Attributes are necessary to them. There are the three following distinctions between apperception and sense-perception:

1. Apperception is a mental attribute, sense-perception is a stage in the development of knowing.

2. Apperception is more fundamental than sense-perception.

3. Apperception is a broader term than sense-perception.

The Cultivation of Sense-perception.—By cultiva-

tion of sense-perception is meant so exercising it as to change it from a more or less inefficient condition to one of high efficiency for use in living. This is popularly spoken of as making one a good observer, and that there is need of being a good observer almost every one agrees. There are several definite reasons for desiring to have well cultivated sense-perception.

1. It gives one a great advantage in practical economic activity.

2. It enables one to get so much more out of life. It makes life much more worth living.

3. It adds considerably to one's appreciation of literature.

4. It is the solid and concrete foundation for all kinds of education.

5. It arouses and fosters the scientific spirit.

First, the person who observes the various aspects of his environment carefully sees the things that need to be seen, while the one who has not this habit passes by unnoticed many of the essential things in the affairs of practical life. It is not usual for men and women to know the common trees of the community in which they were reared; nor the common birds, the common friendly and injurious insects, the common mammal friends and mammal enemies, the common beneficent and injurious winds, the relief forms and soils, and the common stars, planets and constellations to be known in the community in which they were reared. Some people make a success of every business undertaking, others make a failure of every business undertaking, and one reason for

the difference is that some can observe while others can not; that is, some have trained sense-perception, others have not.

Secondly, certainly the one who has eyes and can see, ears and can hear, a nose and can smell, a mouth and can taste, largely, whatever comes into such a position as to furnish a stimulus gets more out of living than the one who can do these things to a less degree. The one who loves nature gets much more out of life than the one who does not. He always sees something to admire, to attract, to look forward to, and to hope for. He gets happiness from winter; with glad expectancy he awaits the coming of spring; he gets life from the summer sunshine and developing nature, and sees with joy the maturity of autumn.

> "To him who in the love of Nature holds
> Communion with her visible forms, she speaks
> A various language."

Fortunate is he who early learns to love fervently nature. It will prove one of his greatest blessings.

Thirdly, there are many selections of literature which have beautiful pictures, but which must mean very little to one who has not observed nature.

> "Meadows trim with daisies pied,
> Shallow brooks and rivers wide."
> "Around it still the sumacs grow
> And the blackberry vines are running."
> "Singing she wrought and her merry glee
> The mockbird echoed from his tree."

Such pictures are a source of much more interest

and pleasure to one who has observed such as they represent.

Fourthly, the cultivation of sense-perception is the sure foundation on which to rear the educational structure. Children read poorly, because they don't observe. People spell poorly because they have not learned to observe, because they have not learned how to observe. They are poor in arithmetic because they have not learned how to observe. They study about things which they do not understand because they have not observed them. Their geography is verbal memory largely because they have not observed the things about which they study.

"The education of the senses neglected, all after education partakes of a drowsiness, a haziness, an insufficiency which it is impossible to cure."

Lastly, the cultivation of sense-perception arouses and fosters the scientific spirit. The scientific spirit is the spirit of search for the truth; the spirit that is not afraid to search for the truth; the spirit of investigation that the truth may be found. It is the attitude of mind that makes anything short of truth hateful; that believes in the ultimate triumph of truth. It is the spirit of free inquiry and free investigation, and its watchwords are experiment, observe, and think.

The Method of Cultivating Sense-perception. — Sense-perception is cultivated by throwing students upon their own responsibility, and by leading them to find out things first hand for themselves; by bringing them in sensuous contact with whatever they are study-

ing that will admit of such contact, and by suggestions and questions stimulating them to find out truth for themselves.

The spirit of the method of cultivating sense-perception may be obtained from the following:

"Agassiz's pupils usually had excellently trained perceptive faculties as one result of his teaching. Since his pupils generally succeeded well in life, it will be profitable to notice how he trained them. A certain student who wished to be well grounded in zoology presented himself at the professor's laboratory one morning. The professor immediately pulled a fish out of its jar of alcohol and said: 'You are to look at this fish carefully and tell me when I return how much you have seen. You must not cut it nor use any instrument upon it.'

The professor then left the student alone with the specimen. The student had seen fish before. He knew that they were oblong objects with fins and scales, but he looked at that special fish for ten long minutes. He was sure that he had seen all that was visible from the outside, and he started to tell the professor so. The museum was carefully searched, but the thoughtless instructor had left the building. There was nothing for the disgusted student to do but to return to stare at the uninteresting fish. Feeling that his time was too valuable to be wasted in this way, he nevertheless looked at the fish for half an hour without seeing anything. Then he turned the fish over. He looked at it in the face; he gazed at it from above, below, behind. Two hours passed and he was inexpressibly disgusted. He knew

that it was a fish; but he was sure of that before he came to the great Agassiz.

The student then put the fish in the jar and went to lunch. When he returned he found that the professor had been there and gone away somewhere to remain several hours. It seemed strange that such a man should be wanted for a teacher. Again the disgusted student stared at the fish. This was growing tiresome, and to amuse himself, he began to count the scales. Feeling that this was nonsense, a happy thought struck him, and he proceeded to draw the fish. He had just made the interesting discovery that the fish had no eyelids, when Agassiz returned and remarked that a pencil was the best of eyes. He asked the student to tell what he had seen and looked disappointed at the shortness of the recital. 'You have not looked very carefully, keep on looking' said Agassiz, who then left the room.

The student then went to work with a will, and, with his pencil, he began to make new discoveries, and to wonder how it was possible for him to see so little at first. For three long days he was made to gaze at the fish. Agassiz would occasionally return to listen to a recital of new discoveries, but would answer no questions."

Time to Cultivate Sense-perception.—From the ages of two to twenty is the proper period for cultivating sense-perception. If a person is not a fairly good observer at the age of twenty the chances are he never will be. Not that he could not be, but that the life of most persons is so much of a treadmill that the time and trou-

ble are not taken in ninety-nine cases in a hundred to cultivate it.

In any case, though, the cultivation of sense-perception is much more difficult after the age of twenty.

Subjects to Cultivate Sense-perception.—There are a number of subjects which will, if properly taught, prove good to cultivate sense-perception. In the primary schools nature study, geography, and primary language are all good. And in the secondary schools and colleges and universities, botany, zoology, geology, chemistry, physics and astronomy are among the best. And drawing, whether taught as a separate subject or in connection with other subjects, is of the *highest* value.

Read:

1. Halleck's Psychology, pp. 66-100.
2. Pillsbury's Psychology, pp. 156-187.
3. Angell's Psychology, pp. 122-160.
4. Dewey's Psychology, pp. 156-174.
5. Colvin and Bagley's Human Behavior, pp. 213-225.

CHAPTER XIII.

Memory.

General Nature.—Every experience one has leaves him somewhat different from what he was before he had the experience. This holds true whether the experience be mental or physical. One's mind acts in a certain way to-day and to-morrow it acts in the same way a little more easily. Something from the first activity stayed with the mind, and so something from every activity stays with the mind; that is, the mind *retains* something from every activity. All that may with certainty be said concerning the nature of what is retained is that it is the *effect* of the activity. This effect makes it easier for the mind to act again as it has acted before, and the mind because of this will react its experiences again with less stimulus, or provocation. And when it does react its past experiences it knows it is doing so; that is, it knows it has had this experience or that experience before.

Illustration.—One sees to-day for the first time in his life some poison ivy. Not knowing its poisonous nature he is in the act of examining its berries when with a show of much fear some one tells him how dangerously poisonous it is. He is strongly impressed with what he has heard. A month later in taking a walk, he finds himself among some bushes and vines and seeing that he is almost in contact with some poisonous ivy, he fairly

runs away. He does not have to be told about it this time.

We say he remembered his former experience. But an analysis shows he *retained* the effect of it, *reacted* it, and knew he had had something of the same experience before, that is, identified it.

This whole process just thought through is what is known as *memory* by psychologists, and it is the *second stage* in the development of knowing. The following definitions formulate the above thought:

Memory is the mind's process of retaining the effect of our experiences and of reacting and identifying them.

Memory is that stage in the development of knowing in which the mind retains the effect of our experiences and reacts and identifies them.

Elements of Memory.—The elements of memory are evidently three: 1. Retaining. 2. Reacting. 3. Identifying. One of course can not remember, if he can not retain. The mind would act the experience no more easily a second time than the first time unless something was retained from the first experience. But we doubtless retain something of the effect of many of our experiences that we never react. There is no need for reacting them, so we do not do it. Thus while retaining is always necessary in memory, retaining alone does not insure memory.

Unless the experience were in consciousness a second time, no one would say he remembers. Any one on the other hand would say he does not remember, and he would be right. There is no memory without react-

ing. But as in the case of retaining, reacting does not insure memory. Any of us retain the effect of many experiences, and react the experiences without knowing we have ever had the experience before. And no one of us says he remembers under such circumstances. All of us say we do not.

Illustration.—We meet some one who speaks to us, and says do you remember me. We often are compelled to say, I do not think I do. He gives us a further suggestion and then we say we do. Something was retained or we would not have known him at all. We were reacting, because the same person was before us. But until he gave help by way of suggestion, we were not remembering, because we were not aware we had had the experience before.

One may retain and react without remembering.

If we retain the effect of the experience, react the experience, and know we have had the experience before, we always remember.

Retaining.—The mind is not a storehouse into which we put mental things. The mind is energy manifesting itself in consciousness. The energy is stored in the brain. But just what effect the mental experience has on the brain so that it occasions the mind to act again a little more easily than it acted before, no one knows. But, that there is some sort of trace left in the brain which is the physical basis of retaining, scientists are pretty certain. And it is this tendency, this effect of our experiences, on our minds which we retain.

We do not retain ideas, we do not retain knowledge,

for when we do not have them in consciousness, they have no existence, they are nowhere. An idea or a point of knowledge is the mind's working, or acting, in a certain way. When this acting is not going on, the idea or knowledge is not in existence. The activity the piano player puts forth is the playing he does. Where is the playing when he is not playing? It is not any place. It has no existence. So one's knowledge, since knowledge is activity, has no existence when it is not in consciousness.

Rightly, in our present state of knowledge, all we can say is that we retain the *effect of our experiences.*

Reacting, sometimes called *reproducing,* is simply acting again as the mind has acted before.

Identifying, sometimes called *recognizing,* is knowing that we have had the experience before, or it is knowing that we are reacting. In it the mind identifies the present experience with the past experience.

The Law of Memory.—The mind remembers its experiences because of some *suggestion,* or *cue,* as Mr. James calls it. Mr. Halleck says he was one time in a distant city, and suddenly he remembered the campus at Yale. At first he could not account for the idea of the Yale campus appearing in mind. Then he was aware that he was hearing someone whistling a tune which he had heard whistled or sung on the campus at Yale. The idea of the tune was the suggestion. or cue, It is always this way with memory except in those cases where some stimulus breaks in upon us from the outside world. The sensation or sensations in those cases constitute the sug-

gestion, or cue, instead of some experience which had been suggested by some previous experience. But in any case we remember by means of association. So the law of memory may be stated as follows:

The mind remembers wholly because of association.

Strictly speaking there are not laws of memory as sometimes stated. The so-called laws of memory will be found upon careful analysis to be laws of association, or suggestion. This point will be elaborated in the later discussion.

Association.—One thing puts us in mind of another because they have been associated. When the idea of the word, *elephant,* comes into consciousness, the idea of the object, *elephant,* comes into consciousness because they have been associated, or when the idea of the object, *elephant,* comes into consciousness, the idea of the word, *elephant,* comes into consciousness because they have been associated.

When the idea of the object, *apple,* comes into consciousness, the idea of the word, *apple,* comes into consciousness because they have been associated, or when the idea of the word, *apple,* comes into consciousness, the idea of the object, *apple,* comes into consciousness because they have been associated.

The idea, *orange,* may put one in mind of the idea, *Florida,* or the idea, *Florida,* may put one in mind of the idea, *orange,* because they have been associated.

If we can find out what the mind has done with these two ideas which causes one of them to suggest the other, we will have found out just what association is.

It can not be resemblance which causes one to suggest the other, because there are hardly any two things more unlike than, for instance, the object, Florida, and the word, Florida, nor is there any other logical connection. But in these cases and in all other similar cases the thing that has occurred is that *these ideas have been in consciousness at the same time or in close succession.* They thus became parts of one mental activity, so when the mind started in on this activity by bringing one idea into consciousness, it, according to the attribute of iterativeness, went on and brought the other idea into consciousness.

The following definitions will formulate the above thought on the nature of association:

Association is the mind's process of holding two or more experiences in consciousness at the same time or in close succession.

Association is the mind's process of making two or more experiences parts of one mental activity.

Why the Mind Associates.—There are various reasons why the mind associates experiences or ideas. The following are some of the important ones:

1. The mind associates experiences because of their resemblances. The mind associates the idea of Alexander the Great, with the idea of Napoleon, Daniel Webster with Demosthenes, and a star with the sun.

2. The mind associates the idea of the cause and the idea of the effect. The mind associates the sting of a bee with inflamation and swelling; a blow on the head with unconsciousness.

3. The mind associates the idea of the whole and the idea of the part. The mind associates the idea of a wheel of a wagon with the idea of a wagon, the idea of a school with the idea of a teacher.

4. The mind associates the means or instrument with the end. For instance, the mind associates the idea of a saddle with the idea of a ride on horse back; the idea of a piano with the idea of music.

5. The mind associates the ideas of things contiguous in space. Thus the mind associates a tree with a pool of water by which the tree stands; Chicago with Lake Michigan.

6. The mind associates things *arbitrarily;* that is, without there being any thought reason for its doing so. Thus it associates the idea of the word, dog, with the idea of the object, dog; the idea of the word, cow, with the idea of the object, cow. There is no reason in thought, so far as we know, why a cow should be called a cow, or a dog be called a dog. These are just arbitrary associations.

There are other reasons why the mind associates experiences, but these are the main ones and are sufficient to show that associating ideas is much more than merely seeing likenesses between them.

Classes of Association.—On the basis of time association divides itself into *simultaneous* and *successive.* If the experiences are in consciousness at the same time the association is simultaneous, but if the experiences succeed each other closely in consciousness the association

is *successive.* These truths may be formulated in the following statements:

Simultaneous association is that kind of association in which the mind holds two or more experiences in consciousness at the same time.

Successive association is that kind of association in which the mind holds two or more experiences in consciousness in close succession.

Classes of Association on Basis of Reason.—On this basis, the basis of why the mind makes the association, there are in general two classes. In one class there is a thought, or logical, connection between the experiences associated. In the other class there is no logical connection between the experiences associated. Thus the cause is logically connected with the effect; the means, or instrument, with the end; but no such connection exists between the idea of the word, *table,* and the idea of the object, *table.*

So on the basis of the reason for the mind's making the association, there are the following classes of association:

1. *Logical.*
2. *Arbitrary.*

The following are formal statements for them:

The logical association is that kind of association in which the mind forms thought connections between its experiences.

The arbitrary association is that kind of association in which the mind does not form thought connections between its experiences.

The Laws of Association.—Experiences come into consciousness in series, one following the other because of definite reasons. This following of ideas one after another in consciousness is called the *sequence* of ideas. The sequence of ideas obeys laws, and these laws are known as the *laws of association.* There are two kinds of these laws of association: 1. Primary. 2. Secondary.

The Primary Law of Association.—When two or more experiences have been in consciousness together, either at the same time or in close succession, they become parts of one larger mental activity and are closely bound together. This union established between experiences is in all probability never entirely broken down. It may grow very weak, but some trace of it probably remains during the entire life of the individual.

One may learn a Latin verb when he is sixteen years old and forget it in a short time, and never repeat it till he is sixty-six years old. Then if he attempts to re-learn it, he soon finds that something has remained with him during all those fifty years. Some traces of the connections made there have not been entirely lost.

This psychological fact is some encouragement to one in studying, even though he seems to forget the most he learns.

The truth emphasized in this study is the truth called the primary law of association. The following formulates it:

When two or more experiences have been held in consciousness at the same time or in close succession a

connection is established between them which is never entirely lost during one's life.

The Secondary Laws of Association.—It often happens in our mental lives that one experience will at different times be associated with many other experiences, but not equally strongly. Some of the associations will be very strong and some of them moderately strong and some of them weak. For instance, the idea, (an idea is an experience), *forest,* at one time is associated with the idea, Indians; at another time with the idea, wolves; at another time with the idea of an excursion; at another time with the idea, springs; at another time with the idea, panther; at another time with the idea, lumbering; at another time with the idea, fires. Not all these connections are made equally strong, and the secondary laws of association explain why they are not made equally strong.

A secondary law of association is a law of association which explains why an experience is associated more strongly with some experiences than with others.

Of these secondary laws there are six pretty well marked off, as follows:

1. Correlation.
2. Repetition.
3. Emotion.
4. Attention.
5. Recentness.
6. Disintegration.

Correlation.—This law has reference to associations made between experiences by thinking, and the connec-

tions are thought connections. If a cause is associated with an effect, an instrument with its work, a whole with a part, an object with another much like it, thought accompanies the association and the association is thereby made strong. This kind of association is, though, what has been previously studied as *logical association.* From the above the law may be formulated as follows:

Those experiences held in consciousness together by logical association are, other things equal, the most strongly associated.

Illustration.—If at one time the idea Thomas Jefferson is associated with the Declaration of Independence, or the Louisiana Purchase, and at another time, with the planet, Venus, when again the idea Thomas Jefferson comes into consciousness, according to the law of correlation, the idea of the Declaration of Independence, or of the Louisiana Purchase should come into consciousness. Because there were thought connections between Thomas Jefferson and the Declaration of Independence, or the Louisiana Purchase, but none between him and the planet, Venus. And the reason is that the idea Thomas Jefferson is more strongly associated with the idea Declaration of Independence, or Louisiana Purchase, than with the idea Venus.

Repetition.—It is evident that repetition renders our experiences more effective. And this is true of associations as well as of other experiences. One can be made to learn and remember almost anything, if it be repeated often enough in his presence, whether he desires to do so or not. So repeating associations makes

them strong. This truth is formulated into a law as follows:

Those experiences held together in consciousness the most frequently are, other things equal, the most strongly associated.

Illustration.—If the idea, California, has been held in consciousness with the idea, Pacific Ocean, more frequently than with the idea, orange, when the idea, California, comes into consciousness the idea, Pacific Ocean, will come in rather than the idea, orange. This law is also illustrated well by the fact that when the idea of any object comes into consciousness almost always the idea of the name of that object comes into consciousness first, or if the idea of the name comes into consciousness the idea of the object comes into consciousness. These, the idea of the name and the idea of the object are repeated in consciousness more often than any other associations.

In each case above the ideas came into consciousness as they did because of the associations having been made strong by repetition.

Emotion.—Everyone knows that when we have a great deal of feeling accompanying an experience, we remember the experience well. If we are scared much at an experience we almost certainly remember that experience well. If we are amused at some occurrence, we are apt to remember it well. So emotion, or feeling, accompanying association makes the association strong. Because of this some experiences seem to burn their way

into our lives. This truth is formulated into a law as follows:

Those experiences held together in consciousness with the highest degree of feeling are, other things equal, the most strongly associated.

Illustration.—A boy was crossing a bridge on horseback when a broken board in the bridge flew up at one end because of the horse's stepping upon it at the other end. The horse becoming frightened at this, jumped, threw the rider and fell at full length off the end of the bridge into the mud and water some eight or ten feet below. Now, when this man sees a broken board in a bridge, he thinks of this experience in preference to others, though broken bridge boards have been associated with other experiences in his life. And this is because the association was made so strong by the feeling connected with it.

It seems as if nearly any feeling accompanying an association will make it strong. It may be interest, anger, fear, embarrassment, hope, surprise, love, hate, pleasure, pain, and many others.

Attention.—It is a truism that we remember well what we pay careful attention to, and that we remember poorly what we give but slight attention. This fact exists because good attention makes a strong association and poor attention makes a weak association. The formulated statement of this truth is as follows:

Those experiences held together in consciousness with the highest degree of attention are, other things equal, the most strongly associated.

Illustration.—If one associates the idea, elm tree, with the idea, horse, but gives it little attention at one time, but at another time associates the idea, elm tree, with the idea, wet ground, but gives attention and notices that elm trees grow best in such ground, when the idea, elm tree, comes into consciousness the idea, wet ground, will come into consciousness in preference to the idea, horse And this will be true because the association between the idea, elm tree, and the idea, wet ground, will be stronger than the association between the idea elm tree, and the idea, horse.

Recentness.—Experiences in consciousness recently are more easily remembered than those which have not been in mind for a long time. This is because all associations grow weak with time unless repeated. But even though it be the first time an association has ever been made, if it be recent, we may well remember the experiences associated. This truth formulated into a law is as follows:

Those experiences held in consciousness together the most recently are, other things equal, the most strongly associated.

Illustration.—If one has at one time associated the idea, Detroit, with the French in America, and more recently has associated the idea, Detroit, with the automobile industry in America, when the idea, Detroit, comes into consciousness, according to the law of recentness, the idea of the automobile industry in America will come into consciousness. And this will be because the association between the idea, Detroit, and the idea of

the automobile industry is stronger than the association between the idea, Detroit, and the idea of the French in America.

Disintegration.—Experiences which stand out definitely and clearly in consciousness are much more easily remembered than those which are vague and confused. It is in the light of this truth that one says I want to understand that well, because I want to remember it. We remember better, of course, because the association is stronger when the thing is clear; that is, has no entangling relations. The formal statement of this truth is as follows:

Those experiences held in consciousness together the freest from entangling relations are, other things equal, the most strongly associated.

Illustration.—If the idea, the tariff, is at one time associated with the idea, the development of manufacturing, the relations between the two being clearly seen, and at another time is associated with the idea, immigration, the relations between the two being confused, when the idea of the tariff comes into consciousness, the idea of the development of manufacturing will come into consciousness, according to the law of disintegration, in preference to the idea of immigration. And this will occur because of the stronger association between the idea, tariff, and the idea, development of manufacturing, than between the idea, tariff, and the idea, immigration.

Each of these laws of association seems to have developed in our lives in the evolution of the species because of its survival value. And if such be the case it

will find its justification some way in human behavior. So we may valuably trace their connection with school work to a small degree, at least.

The law of correlation justifies organizing our work. Any kind of work that is unorganized is wasteful of both time and energy, and this truth applies with unusual force in all school work. Any school subject not organized teaches one neither how to remember nor to think in the best way. To organize is to think, and to think is to learn how to remember in the best way. So the meaning of the law of correlation in terms of behavior is, *organize.*

The law of repetition justifies frequent reviews in school work, but not without discrimination. Reviews on the things essential for guidance in human behavior are among the most valuable school exercises. Such things in the light of the law of repetition may be properly repeated till the association is so strong that it will never fail one when needed.

The law of emotion justifies the effort to make school work interesting. It is almost self-evident that there can be no good school work without a good degree of interest, but oftentimes the conditions for school work are the determining factors of interest as well as the efforts of the teacher. And too much embellishment may arouse indirect interest and preclude the direct interest, the interest which ultimately possesses inherent value. Interest, it will be remembered is a feeling.

The law of attention justifies the teacher in demanding the attention of his students. No very good school

work is likely to occur in which students do not feel it a duty to give attention. The student who does nothing but what he likes to do, does no more, in principle, than the animal, savage and child. The lesson ought to be thoroughly learned that there is strength born of doing one's duty against his inclination. This is the silent precept of the law of attention.

The law of recentness justifies reviews before examinations. But justifies in a more important sense the preparation for any kind of behavior whatever which depends upon accurate intelligence, in refreshing our minds upon required points of truth. The precept here is accuracy of intelligence requires recent intellectual preparation.

The law of disintegration justifies the teacher's unwillingness to permit any point to pass by which is not clear to the learner; also, the unwillingness on the part of the learner to pass by points in school work which are not clear to him. The silent command here is understand every point perfectly clearly.

Results of Association.—When one experience is associated with another experience, and one of them later comes into consciousness the mind is carried back to the other experience. A connection has been established between the experiences and by way of this connection the mind goes from one to the other. Thus there is a connection between the idea of the word, stone, and the idea of the object , stone, and this connection has been established by associating these ideas. But again we say there is a relation between the idea of the word, stone,

and the idea of the object, stone. So it must be that one of the results of association is *relation.*

Relation.—This term comes from *re,* meaning *back* and *latus,* meaning *borne.* By dropping the "*us*" and adding *ion, the act of,* we have the term *relation,* literally meaning the act of bearing back. Now this connection between experiences resulting from associating them is the *relation.* So we have the following formal definitions for it:

Relation is the connection the mind makes between its experiences by holding them in consciousness at the same time or in close succession.

Relation is the connection the mind makes between its experiences by making them parts of the same mental activity.

Kinds of Relations.—The mind makes relations between the idea of the cause and the idea of the effect; between the idea of the instrument and the idea of the end; between the idea of the whole and the part, and the idea of one object and the idea of another similar object, but it also establishes relations between the idea of the figure 8, and the idea of the number 8, a very different sort of relation. Thus there are grounds for the two classes of relation:

1. Logical.
2. Arbitrary.

The logical relations are such as thinking, or inference, helps establish. Thus knowing the whole we can think out to some extent the part, or knowing the cause we can think out to some extent the effect.

The arbitrary relations are those which the mind makes without the aid of thought, or inference. No one could ever think out the name of a *river,* or very many other names of objects, without having been told at sometime the name. How would one ever be able to know that a dandelion is called a dandelion, or *Taraxacum Dens-leonis,* without having been told, and what reason is there any way for calling this object a dandelion? The association is arbitrary and so is the relation.

Suggestion.—When two or more experiences have been in consciousness together and afterward one of them appears in consciousness, something often causes the mind to go on and bring into consciousness the other or others. This seems to be the stimulating influence of the first experience or idea. That an idea is a stimulus to the mind seems very clear, but so is any other sort of mental experience. One speaks the single word, *mother,* in the presence of a crowd, or the single word, *fire,* and many minds are stimulated to call into consciousness various experiences, and the stimulation of the mind by the experience was the occasion of the activity, or was the *suggestion.* This then may be formulated into the following definition for suggestion:

Suggestion is stimulating the mind by an experience to call into consciousness another experience which has been associated with the stimulating experience.

Suggestion is a second result of association. Suggestion may be the stimulating effect of an experience aroused by a word, oral or written, a gesture, or any sort of physical activity. The experience may be aroused

intentionally or unintentionally by other persons or by one's self or by impersonal things.

The laws of suggestion are the same in name as the laws of association. 1. Primary. 2. Secondary.

The primary law is stated as follows:

When two or more experiences have been in consciousness at the same time or in close succession, and afterward one of them appears in consciousness it tends to stimulate the mind to bring the other or others into consciousness.

The secondary laws of suggestion are the same in number and name as the secondary laws of association. They are: 1. Correlation. 2. Repetition. 3. Emotion. 4. Attention. 5. Recentness. 6. Disintegration.

These laws may be stated nearly as the laws of association are stated, as follows:

Correlation.—Those experiences held in consciousness together by logical association are, other things equal, most likely to suggest each other.

Repetition.—Those experiences held in consciousness together the most frequently are, other things equal, most likely to suggest each other.

Emotion.—Those experiences held in consciousness together with the highest degree of feeling are, other things equal, most likely to suggest each other.

Attention.—Those experiences held together in consciousness with the highest degree of attention are, other things equal, most likely to suggest each other.

Recentness.—Those experiences held together in

consciousness the most recently are, other things equal, the most likely to suggest each other.

Disintegration.—Those experiences held together in consciousness the most free from entangling relations are, other things equal, the most likely to suggest each other.

These laws of suggestion, likewise the laws of association, do not oppose each other, but mutually work together for the efficiency of memory. For instance, if the cause suggests the effect by the law of correlation, if repetition, emotion, and attention are called to the aid of correlation, the tendency for the idea of the effect to come into consciousness when the idea of the cause comes in will be greatly strengthened. These laws mutually help each other.

Classes of Memory.—On the basis of development there are four classes of memory:

1. Recognition.
2. Remembrance of the Particular.
3. Remembrance of the General.
4. Recollection.

Recognition.—Recognition is the least developed kind of memory and is most like sense-perception, but it is somewhat in advance of sense-perception in development. In recognition the object is always present as it was in sense-perception, and the object is always particular. In addition to re-perceiving the object the mind always knows that it is reacting the activity corresponding to the object at a different time from that of the former activity, and always at a somewhat different place.

The advance in development of recognition over sense-perception consists of three things:

1. Knowing that the mind has known the particular object before.

2. Knowing the object in more time relations; that is, in both present and past time.

3. Knowing the object in more place relations.

Illustration.—If one looks out of his window, sees some object on the street and knows it to be an automobile, but is not aware that he has ever seen this particular one before, the mind's activity is merely sense-perception. But if the automobile should be some particular one he has known before, the mind's activity is a case of recognition, providing he is aware he has known it before.

One passes down the street and meets his friends, and says he recognizes each one. He is using the term, *recognize,* just right, for in each case he is re-knowing his friend in an act of recognition. The object, his friend, is particular, present, and is known to have been known before.

Remembrance of the Particular.—Remembrance of the particular is the next higher kind of memory. It is much like recognition. The object known is always a particular object, but is never present in space.

The process of remembrance of the particular is as follows: the mind has an experience, some part of which, or the whole of which has been associated with the idea of a previously known object. From the suggestion of this associated experience or element the mind reacts

the activity, appropriate to the previously known object and remembers it.

The main advance in development of remembrance of the particular over recognition is that it enables the mind to think of objects when they are not present. This is a large advance, for to be able to think of objects only in their presence would detract greatly from the mind's power of thought.

Illustration.—One sees a basket of fruit sitting in a show window, and it suggests to him a particular fruit farm he has known in Oregon or Virginia. From the suggestion of the basket of fruit the mind thinks the whole activity appropriate to the fruit farm previously known, and remembers it.

Remembrance of the General. — The next higher kind of memory is remembrance of the general. In this kind of memory the mind remembers a *general idea,* or *general notion,* or *class.* If, when a child is given a piece of crayon and told to make triangles on the board, he is able to do so, it is because he remembers the *general idea,* triangle.

The mind's process in the remembrance of the general is as follows: the mind gets an experience in consciousness which has been associated with the general idea. This experience suggests the general idea, and the mind remembers it.

The advance in development of remembrance of the general over remembrance of the particular is that it enables the mind to deal with classes, to know them and think about them. This is a greater advance than one

is likely to appreciate at first. It saves the mind a great deal of time and a great deal of energy. One who could think only with particular ideas could never advance beyond the stage of infancy in thinking.

Illustration.—A teacher held up an overshoe and asked the students what it suggested to them. A student said it suggested a flatboat to him. The teacher asked what one and the student replied no particular one, just the general idea, flatboat.

Recollection.—Recollection is the most developed kind of memory. It is characterized by a special effort to get hold of some associated line of experiences which will suggest the thing to be remembered.

The process of recollection is as follows: the mind tries to remember something and does so partly, but there is some part of the activity lacking. The mind is aware that there is a missing part, and makes a special effort of the will to bring into consciousness some associated line of experiences to suggest the missing part. If it succeeds, the activity is one of recollection.

Illustration.—One sees a flower, but can not remember its scientific name—the missing part. One then tries to think where he first saw the flower, how its name looked on the page of the book used as the key, when he identified it, etc. and thus succeeds in recalling the name.

A gentleman stepped into a store and saw a man whose face seemed familiar and whose voice also sounded familiar, but whose name and the place where he had been known he could not remember. He then made an effort to get a hold on some associated line of experience

to suggest the name and circumstances under which he had been known. He went back to the different places in which his life had been spent for five years and at length thus remembered the missing part, the name and circumstances under which the gentleman had formerly been known.

The advance in development of recollection over the other three kinds of memory is in (1) *the effort involved;* (2) *in the number of relations grasped.* In the effort to follow up some associated line of experiences to suggest the missing part of the experience to be remembered, many relations are grasped.

On another basis there are the classes of memory which William James calls (1) *the desultory memory;* (2) *the philosophic memory.* These classes are made on the basis of the kind of association involved.

The Desultory Memory.—The desultory memory is such memory as one uses in learning almost isolated facts, as, the names of the letters of the alphabet or symbols of the forms of the letters; or the name of a tree as the symbol of the object itself. The memory which most psychologists say we use in remembering the length of rivers, the names of cities, the populations of provinces, the principal parts of verbs, the spelling of many words, etc., is of the desultory kind. Logical relations play no part in it. The following is the formal definition for it:

The desultory memory is that kind of memory in which the mind remembers through arbitrary association.

The Philosophic Memory.—The philosophic memory

is the kind of memory which we use in remembering the effect by inference from the cause or the cause by inference from the effect, or by which we can reason to the thing we wish to remember. It is the kind we use in remembering work which is well organized. By use of this kind of memory we remember why Chicago is a large city; why the Panama canal will be beneficial to the world; why Oregon is a fine fruit country; why the United States is attracting more immigrants than any other country in the world. In short, it is the kind of memory in which we remember things by seeing the reasons for these things. The following is the formal definition for it:

The philosophic memory is that kind of memory in which the mind remembers things through logical association.

The Cultivation of Memory.—The popular notion of the cultivation of memory has a good deal of error in it. Popularly it is a favorite thought that any kind of exercise of the memory will add to the efficiency of memory for any kind of memory work; that the general memory will become efficient by exercise after the fashion of the biceps muscle's becoming strong by exercise for any work we wish to turn it to. For instance, it is popularly thought that if one has a poor memory for people's names, he could, for instance, train his memory by learning by heart Gray's Elegy, the squares and cubes of numbers to five hundred, and the names of the muscles of the human organism, so that he would have

improved much in remembering people's names; that is, general exercise will improve the general memory.

Recent studies lead to the belief that there is no truth in this popular thought.

Professor William James says on this point: "It follows also, from what has been said, that *the popular idea that 'the Memory', in the sense of a general elementary faculty, can be improved by training, is a great mistake.*"

Colvin and Bagley say: "The question of the improvement of the memory is an important one. In the first place it should be remembered that an 'all round' memory training is impossible. It has been well said that we do not have 'memory', but 'memories'; that is, we remember some things well and others badly. Indeed, the very fact that my mind is impressed with certain details may mean that I do not attend to others, and hence they are not likely to be stamped on my mind so that they can later be recalled. If I am interested in learning certain formulae in mathematics, I may entirely forget the engagement that I made with a friend. Usually, persons who are 'forgetful' forget certain things only and remember others very well. We call them forgetful simply because they do not keep in mind those matters that we consider important. *Memory can not then be strengthened as we would strengthen a muscle, merely by exercising it in committing any sort of material.*"

If one in studying mathematics seems to improve his memory for history or poetry, the improvement does

not consist in making the memory more efficient but in learning better how to go about it to remember; that is, in learning better methods of remembering. The memory will remain the same, but one learns better how to use it.

A story is told of Abraham Lincoln of an incident analogous to what seems to be the cultivation of memory. Mr. Lincoln was passing through southern Indiana and asked permission to stay for the night at a little house by the roadside. He was granted the favor by the lady of the house, who told him that her husband was not at home, but would be home soon. While she was preparing supper, Mr. Lincoln noticed a fiddle hanging on the wall, and asked permission to use it. He found the fiddle out of tune, tuned it and played some selections on it, and then placed it on the bed. Soon the husband appeared and supper was served. After supper the lady, both she and her husband being fond of music, asked Mr. Lincoln to play some. He picked up the fiddle from the bed, and played while the husband sat enraptured with the music. At the close of two or three pieces, the husband said, "Mary, I would give a thousand dollars for such a fiddle as that."

It was the same fiddle but there was so much difference in the way it was being used.

It is the same memory but there is so much difference between knowing and not knowing how to use it.

"The best way to improve the memory is to improve our methods of memorizing."—Colvin and Bagley.

Remembering then that the only improvement of

memory is to be obtained in learning better how to use memory, its method of improvement will consist in properly applying the laws of association.

Application of the Law of Correlation.—The application of this law in cultivating memory consists in working out the thought relations between the things to be remembered; of organizing our subjects or lessons. This was the secret of the excellent memories of Herbert Spencer and Charles Darwin. Mr. Darwin organized all the facts of organic life around the principle of evolution, and Mr. Spencer organized all facts around the principle of universal evolution.

The cultivation of memory in this way consists in building up the many sided and complex systems of association on the basis of the logical relations between the things we wish to remember. This is the cultivation of the philosophic memory.

The following from Professor William James helps in understanding the thought on this point:

"An educated memory depends on an organized system of associations; and its goodness depends on two of their peculiarities: first, on the persistency of their associations; and, second, on their number."

"The 'secret of a good memory' is thus the secret of forming diverse and multiple associations with every fact we care to retain. But this forming associations with a fact,—what is it but thinking *about* the fact as much as possible? Briefly, then, of two men with the same outward experiences, *the one who thinks over his experiences most,* and weaves them into the most system-

atic relations with each other, will be the one with the best memory.

But, if our ability to recollect a thing be so largely a matter of its associations with other things which thus become its cues, an important pedagogic consequence follows. *There can be no improvement of the general or elementary faculty of memory; there can only be improvement of our memory for special systems of associated things;* and this latter improvement is due to the way in which the things in question are woven into association with each other in the mind. Intricately or profoundly woven, they are held; disconnected, they tend to drop out just in proportion as the native brain retentiveness is poor. And no amount of training, drilling, repeating, and reciting employed upon the matter of one system of objects, the history-system, for example, will in the least improve either the facility or the durability with which objects belonging to a wholly disparate system—the system of facts, of chemistry, for instance—tend to be retained. That system must be separately worked into the mind by itself,—a chemical fact which is thought about in connection with other chemical facts, tending then to stay, but otherwise easily dropping out."

"Your memory for facts of a certain class can be improved very much by training in that class of facts, because the incoming new fact will then find all sorts of analogues and associates already there; and these will keep it liable to recall. But other kinds of facts will reap none of that benefit, and, unless one has also been trained and versed in *their* class, will be at the mercy of

the mere crude retentiveness of the individual, which, as we have seen is practically a fixed quantity. Nevertheless, one often hears people say: 'A great sin was committed against me in my youth: my teachers entirely failed to exercise my memory. If they had only made me learn a lot of things by heart at school, I should not be, as I am now, forgetful of every thing I read and hear.' This is a great mistake: learning poetry by heart will make it easier to learn and remember other poetry, but nothing else; and so of dates, and so of chemistry, and geography."

The cultivation of memory according to the law of correlation thus consists of building up multiple and diverse systems of associations.

Application of Law of Repetition. — Repetition helps to fix anything in mind, so repetition will help in any kind of memory. It does not have to be thoughtless, blind repetition, or rote learning, but may be repetition of the associative system. It may be repetition of what we remember by the philosophic memory. In these cases repetition works with and helps correlation.

But a vast amount of mental stuff must be remembered by the desultory memory; remembered when there is no logical connection between the things we remember. The remembering of the words of a language, the letters of an alphabet, the symbols of numbers, the figures, the height of mountains, the lengths of rivers, the populations of cities, and distances of all sorts are examples of things that can be learned only by repetition. So

repetition is not to be scorned at or slighted in cultivating memory.

One will save himself a great deal of disappointment in life if he does not expect to remember those things which he does not think over often. If one should go to a foreign land where he would not hear his mother tongue spoken for ten years, then return to his native land, he would find that he would have difficulty in remembering his own language so as to speak it.

Application of the Law of Emotion.—Interest is a very general term for all sorts of feeling which the mind connects with an object. Interest strengthens all associations. Then one must be interested in what he wants best to remember. If he can not, he may as well understand at the start that he is not likely to remember well. The inability to be interested in school work is due to two or three causes:

1. Immaturity of mind.
2. Inherent worthlessness of the individual.
3. Bad presentation of the subject to the learner.

Many times a student finds himself not interested in work at the beginning, but if he has inherent worth and will stick to his subject he can work up an interest. And such he must do in many of the important things of life.

So the law of emotion commands us to get interested in what we would remember.

Application of Law of Attention.—No good attention, no good memory, is a truism. The mind must work for what it gets, if it expects it to stay with it after

it gets it. The one who can not pay attention is as clay in the hands of his environment. People trifle with themselves by placing the blame on something else than themselves when they do not pay attention to what they should attend to. If one pays good attention and observes details, it will help wonderfully in remembering. And one may as well know at first that if he does not make the required effort to attend to his work, it will prove a handicap and will baffle his efforts for success and happiness throughout his entire life.

The silent precept of the law of attention is *attend to what you ought to attend to at little cost or at great cost.*

Application of the Law of Recentness.—All associations grow weak with time. So to be sure our memories will serve us most efficiently in cases where accuracy of memory is demanded, we should depend upon recent associations; the recent going over what is to be remembered. To neglect to do so is to neglect to do our duty oftentimes.

Application of the Law of Disintegration.—We remember best what we see clearest, because what we see clearest is freest from entangling relations. A man who spent many years in studying memory has said "One of the most valuable rules for remembering is a well first knowing." It will be found upon examination that many cases of failure to remember are due to the fact that the thing to be remembered was not clearly understood. A clear understanding is a wonderful aid to the memory.

The precept here is, be sure to understand what you expect to remember.

Mnemonics.—Mnemonics is a means of helping the memory to do its work. It consists in remembering some idea, object or experience to be associated with the thing the mind especially wishes to remember. Thus if one has difficulty in remembering the colors of the spectrum in their order, *violet, indigo, blue, green, yellow, orange* and *red,* he learns to spell the word, *vibgyor,* and because each succeeding letter in this word is the first letter of a color in order, he remembers the colors.

> "Thirty days hath September, April, June and
> November;
> All the rest have thirty-one
> Save February which alone, etc."

is used to remember the number of days in the different months of the year.

The art of employing mental objects purposely to associate with the thing we wish to remember is mnemonics.

Value of Mnemonics.—Mnemonics helps the mind sometimes to remember and so are of some use, but psychologists are pretty well agreed that one could never change a bad memory to a good one by the use of mnemonics. They are of only limited use.

"There are many artificial systems of mnemonics, some public, some sold as secrets. They are all so many devices for training us into certain methodical and stereotyped *ways of thinking* about the facts we seek to retain."

"Apart from the extreme difficulty of finding words that are appropriate in this exercise, it is clearly an excessively poor, trivial and silly way of 'thinking' about dates."—James.

Dreams.—Both memory and imagination are involved in dreams. There are four points regarding dreams which the psychology student should know.

1. The mind in dreams obeys the laws of association as well as in waking hours.

2. Our dreams are always made up of old material, though the imagination frequently makes wonderful new combinations out of this old material.

3. We are semi-conscious in dreams and do not hold before us a purpose with which we associate our experiences. Lacking a purpose to hold our minds in line, they do most unreasonable and fanciful things.

4. So far as known dreams do not foretell the future events in any way more than can be known through the ordinary ways of getting knowledge.

Forgetting.—Forgetting is losing from memory that which we have learned. When we get out in life after leaving school we forget the most of what we learned in school. But not every trace of the effect of the learning is lost. Something stays with us from every experience. If it were necessary for us to learn our Latin or Greek again it would be easier for us than at first. We are a little further along, even though we do forget, than we would have been had we never learned.

"It has been definitely determined that *we forget*

what we have learned very rapidly at first and then much more slowly. If we are studying something in which there is little meaning, in which we rely on impression very largely and on association but slightly, a large amount of the material learned will have faded from our minds in the first few hours after we have stopped learning. What remains after this leaves us much more slowly. In memorizing something that has meaning, we find that we forget it less rapidly, although the fact still remains that the rate of forgetting is more rapid at first than it is later on. It has been found that if the subject studied is to be remembered for any length of time without a large loss in the first few hours, *it is necessary to study it beyond the point of merely understanding it.* In other words, if the person wishes to retain what he is learning, he must go over it again and again, even after he is convinced that he has memorized it.''—Colvin and Bagley.

Mind Wandering.—Every one has had the experience of formally reading over a page and at the end not knowing a single thing in it. The mind was wandering; that is, the mind was doing other work than that we purposed to do. Very much like the one who starts on a journey and is attracted to something on this side the road and goes to look at it, then comes back to the road and goes on for a time, then is attracted by something on the other side, forgets for the time what he is doing, and goes to look at it, etc.

Mind wandering is the mental process in which our

minds depart against our wishes from doing that which we purposed to do.

Mind wandering is a loss of mental control. The mind in wandering obeys the laws of association, and, in fact, the mind wanders because of these laws. There are several ways in which the mind wanders, some of which are the following:

1. In reading or studying the mind comes to some idea, and goes off at a tangent, so to speak, and follows out what this idea suggests instead of going forward with connections in which the idea is found. Thus in reading the sentence, Most beautiful orange groves lie hidden in the valleys beyond that snow-capped range of mountains, the mind might pick up the word *orange,* which would suggest *orange blossom,* then go to *marriage, family, courts, divorces, unhappiness,* and so on. This is not an uncommon way for the mind to wander.

2. The mind wanders because of some stimulus breaking in upon it from the outside. Thus one may be studying his lesson, when he hears some one singing "The Heavens Are Telling" and from this suggestion the mind follows out a series of associated ideas before returning to the lesson under consideration.

3. The mind wanders because of some bodily discomfort, as cold, heat, a headache, a toothache. The mind centers itself on the discomfort and follows out the train of ideas it suggests to the neglect of the mental work intended.

4. The mind will be drawn to any important interest away from the intended mental work. If one has

a mother or father dangerously ill, he finds it difficult to hold his mind on his work.

Remedies for Mind Wandering.—It is doubtful whether there is any such thing as a cure for mind wandering, strictly speaking. That is to say, if one finds himself of a type of mind such that his mind wanders to such an extent that it inconveniences and annoys him, it is probably due to the character of his nervous system with which he was born, and which he will take with him throughout his life. He thus will always have this to contend with, and whatever improvement comes will not come in changing one's type of mind.

Definite purposes and *strong interests* in what one is doing will do more than all other things to hold the mind in line.

If one studies a lesson with the definite purpose in mind of being able to make an outline or synopsis of it from his understanding of it, he will find his mind does not wander so easily as when he has a less definite purpose in view. One can listen to a sermon or lecture in the same way. *This is a most excellent mental habit to form and keep.*

If one's interest in a thing has become a passion, he will find his mind will not wander very much from it, or if it does, it will soon get back. So the more one gets into a subject the less his mind will wander, because the more he gets into it, the greater will be his interest.

Probably the only help for mind wandering lies in the development of (1) *definite purposes;* (2) *absorbing interests.*

The Advance of Memory in Development over Sense-perception.—Memory is a higher stage in the development of knowing than sense-perception. Its advances over sense-perception are:

1. The mind knows it has had the experience before.

2. Memory deals with the past and present time, sense-perception only with the present.

3. Memory deals with objects both present and not present in space, sense-perception with objects only present in space.

Memory Involved in Sense-perception.—All is in all in psychology; that is, any complete mental activity involves every other mental activity to some extent. Therefore, memory is involved in sense-perception, and in two ways at the least.

1. Logically in sense-perception the mind always classifies the object perceived; that is, puts it in some known class. But to think the sense-perceived into a class one must *remember the class.* Thus remembrance of the general is involved in sense-perception.

2. Again the main thing the mind does in sense-perception is to *interpret the sensations.* But interpreting the sensations is grasping the likeness and difference between present and past sensations. In order to get the past sensations before the mind it must remember them. Thus the second way in which memory is involved in sense-perception is in *remembering past sensations.*

Read:

1. Angell's Psychology, pp. 184-202.
2. Pillsbury's Essentials of Psychology, pp. 188-214.
3. Colvin and Bagley's Human Behavior, pp. 243-281.
4. James' Talks to Teachers on Psychology, pp. 116-130.
5. Dewey's Psychology, pp. 176-191.
6. Halleck's Psychology, pp. 101-149.

CHAPTER XIV.

IMAGINATION.

General Nature.—Sense-perception begins with the *sensation* and ends with an *idea*—the percept. Memory begins with *any sort of present mental experience* and ends with *identifying* it with a past mental experience. Imagination begins with an *idea* and ends with an *image.*

The mind has the ability of forming an idea and then of putting this idea into a mental image, or picture. If some one tells us to close our eyes and look at the following described apple with the mind's eye, the process of forming the picture is the process of imagination.

A large red apple, three inches in diameter, almost spherical, with a white stripe one-fourth inch wide on one side and a dark-red stripe one-half inch wide on the opposite side, lying on a plate sitting on a stand in the center of a room.

The pictures, or images, of imagination may be almost like objects which have been seen or they may be almost entirely different; that is, highly idealized. It makes no difference though how much they are idealized the imagination depends upon memory to produce the material for its images. The ancients imagined a huge dog, Cerberus, with three immense heads, whose body bristled with snakes in the place of hairs, and whose

barking resembled peals of thunder, as the guardian of Hades. There is nothing new in this picture, but the combination. They were familiar with dogs, heads, snakes and peals of thunder. Memory reproduced these. What is true of this case, is true of all cases of imagination. Imagination is thus dependent upon sense-perception and memory for the materials which it builds into its images.

The image made by imagination is always a *particular* thing; that is, an image having attributes which separate it from every other thing.

From the foregoing study, the definition of imagination is as follows:

Imagination is that stage in the development of knowing in which the mind embodies an idea in a particular form or image.

Image.—An image is a mental thing, a mental product. If an object, as a rose, is present, and we know it is a rose, we have a mental product which is appropriate to the rose, in our minds, but we do not call it an image. We call it an idea. But if afterward we reproduce the product when the rose is not present to the senses, we say we have an image of it. So it seems that what are called images are sensible products; that is, products that originally the mind obtained through the senses. There is the fact known to the mind, though, that external stimulus to the product is absent.

Inference from the above study gives the following definition of an image:

An image is a mental revival of a sensible mental

product without the presence of the external stimulus.

We see a farm house when the farm house is not present—a visual image. We hear the ringing of the college bell, when the bell is not ringing—an auditory image. We feel the roughness of sandpaper, when we are not touching sandpaper—a tactual image. We smell the clover blossoms when there are no clover blossoms to smell—an olfactory image. We taste the strawberry when there is no strawberry to taste—a gustatory image. We feel the warmth of the fire when there is no fire—a temperature image. We feel the resistance of weight when there is no weight—a muscular image.

Kinds of Images.—From one point of view there are as many kinds of images as there are senses: 1. Visual. 2. Auditory. 3. Tactual. 4. Olfactory. 5. Gustatory. 6. Temperature. 7. Muscular.

Most persons have more visual images probably than any other kind. But the one who thinks that we have only visual images does not grasp the meaning of the term image fully. To him who is born blind there can be no visual images. Mr. Hays of Argos, Indiana, who has been blind all his life tells me he has no visual images at all. A blind man thought scarlet must resemble the sound of a trumpet.

From another point of view there are images which almost correspond to some existing object, as the image of a tree we have just passed; and images which do not correspond to any known object, as the Centaur. These classes are sometimes called: 1. *Literal* images. 2. *Constructive* images.

Strictly speaking there are no literal images. No one is ever able to image a thing so that the image will correspond with the object in every detail. There are certain to be some little differences. They may be small, but an analysis will always reveal them.

"We may, therefore, state as a law the fact that images never exactly reproduce the original object. They are subject to constant change from loss of certain elements, from the addition of elements belonging to different experiences, and from changes in the retentive brain tracts."

But some images are much more nearly literal representatives of known objects than others, and the mind is aware of this difference in the purpose of its effort. At one time it tries to make a literal image, at another time it is the intention to change, idealize and construct. We may sum this up as follows:

An image is literal just to the degree to which it corresponds with some known object.

An image is constructive just to the degree to which it does not correspond to any known object.

We study a vase, go into another room and try to make an exact drawing of it. The image we draw from is approximately literal.

We picture a horse with wings flying through the air. The image is constructive.

The Ways in Which the Mind Forms Imaginative Products.—There are several ways in which the mind makes its pictures. The chief ones follow:

1. The mind forms approximately literal images

of objects. One may look at a house, shut his eyes and image as accurately as he can. One makes a drawing to show a friend the exact condition of a grove after a storm. In each case the image the mind forms is as nearly literal as possible.

2. The mind forms images of the separated parts of things. One imagines the head of a horse without the body; the hand writing on the wall; the hand protruding from the water holding the sword; the claws of the eagle; the tooth of the serpent, or beak of a bird.

In forming imaginative products of this kind, the mind employs dissociation. It dissociates things from their usual concomitants.

3. The mind may form images by putting together images of separated objects.

The minds of the Ancients gave us many classical illustrations of this point. The following are some of them: *Centaur,* the head and trunk of a man joined to the body of a horse. *Cerberus,* a dog with three heads, snakes for hairs, barking that resembled thunder, who guarded the entrance to Hades. *Harpies,* birds with the heads of maidens, bodies of vultures and claws of eagles. *Pegasus,* a horse with wings who could fly across the heavens. *Mercury,* a god with sandals propelled by the wings of a bird.

In forming products in this way, the mind employs both dissociation and association. Dissociation separates the parts and association puts them together.

4. The mind forms imaginative products by minifying the images of known things.

In Gulliver's Travels, Swift mentions the Lilliputians, little people so small that they had to use ladders to climb up on Gulliver's body, though Gulliver was just an ordinary sized man. The fairies, the brownies, the dwarfs are products of the minifying work of the mind in imagination.

This kind of imagination is used much by children. With their limited experience, mostly experiences with persons, they go in imagination from a person of ordinary size to one very much smaller. This has something to do with their love for fairie stories.

5. The mind forms imaginative products by magnifying the images of known things.

Gulliver in his travels met men seventy-two feet high in the land of Brobdingnag. In this land Gulliver was given to the baby to play with and almost lost his life by having the baby to put his head into its mouth. Ulysses on his return to Greece after the destruction of Troy was shipwrecked on the island where lived Polyphemus, a giant of the race of Cyclops. Polyphemus was nearly a hundred feet tall, had a pine tree for a walking stick, and had just one eye as large as a saucer. The Ancients pictured Atlas as a giant large enough to carry the heavens on his shoulders. The Norsemen pictured the Midgard Serpent large enough to encircle the earth. The Hebrew imagination gave us Goliath.

Children use this kind of imagination a great deal, too. It is again easy to magnify persons, with whom

most of their experiences are connected, and thus have a giant.

6. The mind forms images by selecting, adapting and fitting images into larger constructive images.

The automobile, the sewing machine, the phonograph; a statue, a poem, and a painting are produced by the mind's working with images in this way.

Classes of Imagination.—On the basis of development there are three classes of imagination:

1. Reproductive.
2. Mechanical.
3. Constructive.

The Reproductive Imagination.—This kind of imagination is much like memory, but it is a little in advance of memory. If one should look at an apple as long as he desired then go into another room and try to embody his idea of the apple into a drawing there would be places in which memory would fail. These places would not be left as gaps in the drawing but would be filled out, and the imagination would do this.

Or one may observe a table or chair as long as he desires, then go from the presence of it, and try to make as accurate a representation in drawing as he can of the object, still he will find many little places where memory fails and the imagination must come to the rescue.

In these cases the idea is reproduced by the memory and imagination embodies it in an image as nearly literal as it can. Such imagination is the *reproductive,* and the following is the formal definition for it:

The reproductive imagination is that kind of imagination which makes images as nearly literal as possible.

Illustration.—One sees a beautiful suburban home and wishes to describe it to a friend. He describes the situation, the size, shape, material, color and architecture of the house; the driveway, the lawn, walks, flowers, shrubbery, fountain, swing, hammock and shade trees; the forest, the lake, the stream and the hill in the background. He makes the picture to correspond with the home and its surroundings as nearly as he can, but it is safe to say imagination comes to the rescue of memory in many places.

This is the work of the reproductive imagination; that is, to make images as nearly literal as the mind can.

The Mechanical Imagination. — As was seen in previous discussion the mind forms incongruous images by putting together images of parts, or changing images in some other inconsistent way. Thus the mind forms an image of man's legs from the knees down attached to a cucumber, or a pumpkin attached to a man's body in the place of his head. In these images, consistency, congruity, proportion and reason are entirely ignored. The mind arbitrarily makes the images. This is the work of the mechanical imagination.

This kind of imagination is a development from the reproductive imagination. It is the images of the reproductive imagination which the mind changes to make the images of the mechanical imagination. These are changed in any sort of arbitrary way. The following statement is the formal definition:

The mechanical imagination is that kind of imagination in which the mind forms images by arbitrarily changing the images of the reproductive imagination.

This is called the *mechanical* imagination because in it the mind works unreasonably, unthinkingly, inconsistently; that is, *mechanically.*

The mind in mechanical imagination may form images by:

1. Combining images of the reproductive imagination.
2. Separating the images of the reproductive imagination.
3. Minifying the images of the reproductive imagination.
4. Enlarging the images of the reproductive imagination.

The Constructive Imagination.—This kind of imagination is also called *creative* imagination. It is the work of the mind in using the images of the reproductive imagination and the mechanical imagination in building up complex images. The images of the reproductive and mechanical imagination are changed, adapted, or fashioned to fit into the proper place in the complex image. This process of building up an image by fashioning the images of the reproductive and mechanical imagination is the constructive imagination. It is seen to be based upon and developed from the other two kinds. The following is the formulated definition for it:

The constructive imagination is that kind of imagination in which the mind makes complex images by

adapting the images of the reproductive and mechanical imagination.

Illustration.—Some one's mind formed the idea of a machine that would run on the ordinary roadway propelled by its own power. The idea must have been vague at first. There were summoned before the mind the images of pieces of wood, iron, steel, copper, brass, aluminum, rubber, asbestos, fiber, porcelain, etc. But these put together as they appeared at first would never make anything that would run. The various images are fashioned so each one will fit into its appropriate place in the image—the mental automobile. And this complex image has become an objective reality.

An enumeration of some of the objective products of the constructive imagination may help to clarify the idea somewhat. They are: 1. Mechanical inventions—the sewing machine, the locomotive, the typewriter, the adding machine, the self-binding harvester, the watch, the steamship, the aeroplane, the trolley car, etc. 2. Architecture—Notre Dame cathedral, the English parliament house, the Vatican at Rome, etc. 3. Sculpture—Venus de Milo, Moses, the Laocoon Group, etc. 4. Paintings—Cistine Madonna, Mona Lisa, the Angelus, etc. 5. Music—"Il Trovatore," the "Requiem," "Choral Symphony," "Tanhauser," etc. 6. Literature—The Tempest, Divine Comedy, Paradise Lost, Iliad, etc. These are but a few of the wonderful objective realities produced by the constructive imagination.

Characteristics of the Constructive Imagination.—There are three characteristics of this kind of imagina-

tion worthy of further study: 1. It is always more purposive than the other kinds of imagination. 2. It is more selective than any other kind of imagination. 3. It involves thinking to a greater extent than the mechanical and reproductive imagination.

In forming images in the constructive imagination the mind has some purpose it is trying to realize, and this purpose is *definite* and *reflective.* This purpose always determines largely the character of the image made, too.

In the invention and improvement of the automobile, hundreds of images have come into the minds of the different inventors, have been dismissed or fashioned under the influence of the guiding purpose, which was never lost sight of in all the minutia of detail.

The architect in planning a building has a definite purpose to be carried out and never loses sight of this purpose even though there are thousands of images to be adapted in the one large complex image.

In adapting the images to suit the mind's purpose, many images come into consciousness, but will not do, so are rejected. The mind has an array of images passing before it that it may select the ones it can incorporate into the large complex image. It, of course, rejects most of its images. It is conceivable that the inventor, the architect, the poet and the painter use only a small number of all the images that come into their minds. Thus the constructive imagination is *selective* to a high degree.

Building complex images adapted to a reflective

purpose involves thinking. One of the elements of thinking is *comparing experiences.* An image is one kind of experience. The inventor, the architect, the painter, the musician, or the poet in building his complex images is constantly comparing the images of the reproductive and the mechanical imagination to get the ones adapted to the consistency of the whole. And this is thinking. No one thinks harder than the inventor or the poet in selecting appropriate images for his invention or his poem. Constructive imagination is thus characterized by a high degree of *thinking.*

The Constructive Imagination and Progress.—Progress in both the sciences and the arts is closely connected with the constructive imagination.

It has been thought that there exists a degree of antagonism between the imagination and the scientific habit of mind; also, that the scientist must adhere to fact and not indulge in the exercise of his imagination. This view is in error. Most of the advances in science have first been grasped in imagination and then the actual experiment, observation, and thinking have proven them concrete realities. The imagination usually leads and the scientific investigation follows, proves and verifies. Imagination thus instead of being a hindrance to scientific investigation is a *necessity* to it.

And in the useful arts and fine arts imagination always leads and blazes a trail for the guidance of other mental activities. Of the useful arts, the printing press, the steamboat, the locomotive, the telegraph, the telephone, the automobile, the aeroplane, etc., are ex-

amples of the objective products of the constructive imagination.

Of the fine arts, the Olympian Zeus, the Collossus of Rhodes, the Parthenon, the Horse Fair, the Aurora, Apollo Belvidere, the Tempest, Hamlet, the "Messiah," "The Creation," etc. are examples of the work of the constructive imagination.

In truth we usually appreciate only to a small degree, unless we are special students of the subject, how inseperably the constructive imagination is connected with progress in both the sciences and the arts.

Limits of the Imagination.—While the imagination is the freest of the stages of knowing it is still not an unlimited power of the mind. The imagination is limited in two ways:

1. It is limited to the material furnished by sense-perception and reproduced by memory in the making of its images. Nothing can ever appear in imagination the material of which has not at some time been furnished by sense-perception. A man born blind and who has remained so has no visual images. A man deaf from birth has no auditory images.

2. And again the imagination is limited in that one can not imagine the infinite. No one can imagine the beginning of time nor the end of time. No one can imagine the end of space, nor a sphere large enough to occupy all space.

Experience and Imagination.—One's imagination is likely to be most active in the direction of his most im-

portant experiences. This point is illustrated in the Norseman's idea of heaven.

"The Norseman painted his heaven, Valhalla, from the suggestions of his own personal experience, which was mostly in the direction of fighting and eating. Valhalla was an enormous palace roofed with shields. Spears were the pillars which supported the ceiling. The seats were cushioned with coats of mail. The gleam of flashing swords warmed the hall. The amusements consistėd of eating and drinking and fighting. A river of ale ran close by Valhalla. The heroes gorged themselves on the flesh of a magic boar, which was renewed every night. They ate and drank until they could hold no more, fell down upon the floor where they had been feasting, were awakened in the morning by the blast of a horn,then they all grasped their weapons and rushed out to the battlefield. All day long they fought, putting each other to sleep with the sword. At nightfall a magical horn was blown, and every hero's wounds were healed. Then there was the mad rush for the river of ale and the flesh of the boar."

Had the Norseman been asked what else heaven contained, he probably would have asked what else it could contain.

Influence of Imagination on Body.—People often imagine certain things that have no foundation in fact. The effect of so doing may be even greater than if the thing imagined were a reality. There are many illustrations of this in life.

A man who said that under no circumstances could

he eat mutton, nor could he eat at the table where it was served, it was so offensive to him, ate of mutton day after day when it was served on the table and called beef.

A man carried a potato in his pocket to cure the headache. He had had the headache frequently for years, when he was told to carry a potato in his pocket and it would prevent his having the headache. He did so, and said it was a certain cure, for he never again had the headache so long as he carried the potato.

Mr. Halleck illustrates this point as follows:

"A member of a family purchased some perfectly fresh meat and it occurred to him that the dinner table would afford a good opportunity of testing the power of imagination on the senses, so he remarked that he was sorry he had not some Frenchmen as guests at dinner, since the meat would have exactly suited them, as it was so gamy and tender that it would not hang on the butcher's hook. Several at once perceived an unmistakably putrid taste, and one member of the family, unable to endure the odor, left the table."

"Were it not for this power of the imagination, the majority of quack nostrums would disappear. In most cases bread pills properly labeled, with positive assurance of certain cure accompanying them, would answer the purpose far better than these nostrums, or even much better than a great deal of the medicine administered by regular physicians.

Warts have been charmed away by medicines which could have had only a mental effect. Dr. Tuke gives many cases of patients cured of rheumatism by rubbing

them with a certain substance declared to posses magic power. The material in some cases was metal; in others, wood, in still others wax. He also recites the case of a very intelligent officer who had vainly taken powerful remedies to cure cramp in the stomach. Then 'he was told that on the next attack he would be put under a medicine which was generally believed to be most effective, but which was rarely used.' When the cramps come on again, 'a powder containing four grains of ground biscuit was administered every seven minutes, while the greatest anxiety was expressed (within the hearing of the party) lest too much should be given. Half drachm doses of bismuth had never procured the same relief in less than three hours. For four successive times did the same kind of attack recur, and four times was it met by the same remedy, and with like success.'

A house surgeon in a French hospital experimented with one hundred patients, giving them sugared water. Then with a great show of fear, he pretended that he had made a mistake and given them an emetic instead of the proper medicine. Dr. Tuke says: 'The result may easily be anticipated by those who can estimate the influence of the imagination. No fewer than eighty—four-fifths—were unmistakably sick'."

A story is told of a criminal sentenced to death, who was given to the surgeons to experiment with. He was told that he would be bled to death. At the appointed time of his execution he was placed in a room separated from another room by a partition. Through a hole, just large enough for his arm, in this partition,

his arm was drawn. His arm was pricked and water just the temperature of the blood was arranged so as to run down his arm from the wound and drop in a basin below. He could hear the blood, as he thought, dropping into the basin and the frequent comment of the attendants on the flow of the blood and the weakening pulse, also the statements of the surgeons as to the time he would die. According to the account he died at almost the precise time at which he would have died had he actually been bled to death.

Many people think that the effect of the imagination in this way applies only to abnormal or weakminded people. Such is an error. Any one may be influenced largely by his imagination after the manner indicated above.

Classes of Imagination on Basis of Effort.—Imagination on this basis may be divided into: 1. Receptive. 2. Productive.

Receptive Imagination.—In reading a story in a book or listening to any one telling a story, the process of forming images is not due to one's own initiative, but due to the suggestion of another. This is the kind of imagination which has been named *receptive,* and the following is the formal definition for it:

Receptive imagination is that kind of imagination in which the mind forms images at the suggestion of another.

Illustration.—Form the images in the following and the imagination is of the *receptive* kind:

> The splendor falls on castle walls
> And snowy summits old in story;
> The long light shakes across the lakes
> And the wild cataracts leap in glory.

Productive Imagination.—When one of his own accord makes from his stock of ideas pictures, such as the writer of stories or the person who tells original stories, the mind forms images because of its own initiative. This is what the poet does, what the inventor does, what the castle builder does and what the day dreamer does. Such imagination is the kind which is called the *productive,* and the following defines it:

The productive imagination is that kind of imagination in which the mind forms images because of its own initiative.

Illustration.—If one composes a story in which there appears a scene in which a child falls into deep water and is rescued by a stray dog, which is then adopted by the parents of the child and given a good home so long as he lives, his imagination is of the productive kind. It is under his own direction.

Fancy.—This term, also, spelled *fantasy* and *phantasy,* has been used to mean the same as imagination. But this use of the term is hardly warranted. The term *imagination* has a broader significance than the term *fancy.* No one probably would say the reproductive imagination is the work of fancy. If one tries to image a tree just as he has seen it, he does not regard his image

the work of fancy. And again the making of a practical piece of machinery, as a potato planter, though the work of the constructive imagination, is not the work of the fancy. The fancy deals with the impractical. But a horse with wheels in the place of feet, fairies, ghosts and goblins, the work of the mechanical and constructive imagination, are also the work of fancy. These are the lighter, less serious forms, of the mechanical and constructive imagination. From the above we thus have the following statement for fancy:

Fancy is the lighter forms of the mechanical and constructive imagination.

The story, Cinderella, abounds in fancy. Aladdin's Wonderful Castle, and A Midsummer Night's Dream have fine fanciful images in them.

Cultivation of the Imagination.—From its character the cultivation of the imagination is somewhat different in general from the cultivation of any other stage of knowing. The cultivation of the other stages of knowing consists in strengthening them, when possible, by exercise. But the imagination in some ways needs to be made more active and in some ways checked in its cultivation.

There is an opinion handed down to us from preceding generations, and held by some at present, that the imagination needs to be suppressed or eradicated in the interest of truth. This thought manifests itself in the opposition to fiction as a whole by some parents and some moral teachers. But the imagination does not need *suppression,* it needs *direction.*

Our schools furnish abundant opportunities for the cultivation of the imagination. The subjects in the schools which will cultivate the receptive imagination are geography, history, literature, nature study, natural science, especially astronomy, and drawing.

Among these geography is usually placed first as suited to cultivate imagination. And it is a certainty that almost every lesson calls into activity the imagination. In forming mental pictures of mountains, plains, valleys, plateaus, rivers, forests, springs, lakes, corn fields, wheat fields, cotton fields, peoples, cities, and hundreds of other things, the child must use largely his imagination.

A point to be recognized though in this connection is, that the imaginative pictures are always formed out of the elements of one's experience and that, for this reason, no proper cultivation of the imagination by geography can be induced in the learner whose mind is characterized by a poverty of first-hand contact with geographical material. This means that in the absence of the concrete work in home geography and field work, geography can not be largely valuable in cultivating imagination.

If the foundation be well laid in contact with nature in home geography and in field work, geography may be made one of the most valuable subjects for cultivating the imagination; otherwise, it can not.

What is true of geography in this respect is true of the other subjects mentioned.

The subjects in school which cultivate the pro-

ductive imagination are primary language, composition, drawing and modeling. The story telling by the learner either orally or in writing, the descriptions and simple narrations, lead the learner to form pictures at his own direction. Writing is the most usual and the best means of cultivating this kind of imagination.

The one who has an undeveloped imagination will miss largely the following in life:

1. The interest and pleasure that make life worth living.

2. Sympathy for other persons, which makes friends for himself and himself unselfish and charitable.

3. That which makes for a good conversationist, entertaining and entertainable.

Dangers of the Imagination.—There are some dangers of the imagination which each psychology student should be aware of.

1. *The image forming activity of the mind may be developed out of proportion to the judgment,* and thus make one *impractical.* Such persons as have done this are easy prey for all sorts of dishonest promoters. They are easily induced to undertake various sorts of impossible things. Since they form vivid pictures of the success of an undertaking, not having judgment in proportion, they easily learn to believe in such success. Such disproportionate development of the imagination is ruinous to any man or woman.

2. *Imaginary achievement may replace real achievement.* "While the individual is reveling in the delights of imaginary situations there is developing with-

in him a taste for such highly colored experiences, and, before he is aware of it, the commonplaces of a world of reality may become unbearable. Stern duties will not be met, and imagining one's self conqueror of an important or difficult situation will take the place of persevering endeavor, which alone can overcome. Firmness of character is thus in danger of giving away."

"There are many persons who have never succeeded in the world's struggle for the simple reason that they never could effectively distinguish between what they pictured to themselves as achieved and what they had actually accomplished. There are not a few of life's failures who have earned millions of dollars in their minds; who in fancy have been social reformers and leaders of men; who have written books, invented flying machines, and become captains of industry, through the mere thinking that these things were accomplished; in a word, who could never quite distinguish between the thought and the deed."

> "Heaven is not reached at a single bound;
> But we build the ladder by which we rise
> From the lowly earth to the vaulted skies,
> And mount to its summit round by round."

Day dreaming promotes this danger, and much popular fiction reading is dangerous from the same point of view.

3. *Imagination may become corrupting* because it is a power as responsive in picturing the evil as in picturing the good. What one lets his mind dwell upon in imagination will influence his activity. If our minds

come in contact with corrupting influences and we picture what these suggest and dwell upon these pictures there is great danger of them becoming real in our lives.

The silent precept here is fill your mind full of the good.

The Advance of Imagination over Memory.—Imagination is an advance in development over memory, and this advance consists of, at any rate, three things:

1. *Imagination fills out the gaps left by memory.*

In remembering any concrete object there are always places where memory fails the mind. We remember partly, but many times not wholly. One may try to remember a thing he knows as well as he knows his own house, but he will always find that there are places which memory can not fill out. He does not know just how the joints at the corners are made, or just the appearance of the wall three feet at the right of the door, or shape of the front steps in detail. If any one is not sure of this point, let him take any object well known and draw it from memory and see the many ways in which the drawing fails to exactly represent the object. The mind fills up these gaps left by memory with the imagination. It endeavors to fill them up in such a way as to be consistent with what is remembered.

If the imagination did not do this work, the mind could not think of things as complete wholes, only in fragments. Thus this is a very important work which the imagination does, and a *distinct* and *essential* advance of imagination over memory.

2. *Imagination deals with past, present and future time, memory with the past and present.*

Sense-perception deals strictly with the present time, memory with the present and the past, but imagination has almost no time limits. This is a second important advance of imagination over memory. It is important because without it the mind could not think definitely of particular things in the future. And thinking definitely of particular things of the future determines largely how we must act towards the future; that is, determines our behavior.

3. *Imagination is a much freer function of the mind than memory.* In memory the mind has no freedom. It must reproduce the experience as it was or it does not do its work the best. To fail to reproduce accurately is to fail to remember well. So memory is limited to the past experience. No such limitation of the imagination exists. It is the freest activity of the mind there is. When Irving said Ichabod Crane's "hands dangled a mile out of his sleeves", it would do for the imagination, but it would not do for memory. When Lowell said that every clod feels an instinct within it which "climbs to a soul in grass and flowers," it was good imagination, but it would have been exceedingly poor memory. When Emerson said a bumblebee is an animated torrid zone, his imagination was good, but it would have been poor memory.

Read:

1. Colvin and Bagley's Human Behavior, pp. 227-242.

2. Pillsbury's Essentials of Psychology, pp. 188-214.
3. Angell's Psychology, pp. 161-183.
4. Dewey's Psychology, pp. 192-201.
5. Halleck's Psychology, pp. 150-179.

CHAPTER XV.

Conception.

Thinking.—Psychologists have sometimes divided knowing into (1) *presentation;* (2) *representation* and (3) *elaboration,* or *thinking,* or *thought.* Sense-perception has been called *presentation.* Memory and imagination have been called *representation,* and conception, definition, judgment, reasoning, systematization and intuition have been called *elaboration,* or *thinking.*

Now, thinking is a somewhat various and varied process, and the term, *thinking,* is one of those general and more or less vague terms which people are accustomed to use. Most persons are not able to tell accurately what they do mean by the term.

In a somewhat general way though all of us have some idea of what thinking is, and we distinguish between thinking and sense-perceiving and remembering.

An analysis of our mental furniture shows us that what we call our knowledge is a great stock of ideas. We have an idea, *tree,* an idea, *house,* an idea, *Socrates,* an idea, *Confucius,* an idea, *virtue,* an idea, *truth,* an idea, *honesty.* In short, everyone has a great stock of ideas, some many thousands. Students of this question say many men and women have more than one hundred thousand ideas, and in the light of recent studies this does not seem too high an estimate.

Now these ideas and some other experiences which

usually are not called ideas are the material with which the mind deals when it thinks. The mind must have material out of which to make its thoughts. One can no more think without material to use in thought than one can eat without something to eat.

The mind compares these ideas and other experiences, assorts and puts them in groups, and asserts the relations between them. This is the mind's way of elaborating or working on its experiences, and this is the process which is called *thinking.* Thus thinking consists of three things:

1. *The comparing our mental experiences—ideas, sensations, feelings, etc.*
2. *The assorting and grouping our mental experiences.*
3. *Asserting the relations between them.*

The formal statement of thinking then is as follows:

Thinking is the mental process of comparing our experiences, assorting and grouping them and asserting the relations between them.

Thinking ability is possessed by the human species to a higher degree than by any other species. Animals lower than man remember and sense-perceive in many cases to higher degree than man, but they think only feebly when compared to man's thinking.

Mr. Halleck's good illustration on what progressive thought has done for man is as follows: "Geologists tell us that ages ago there lived in England bears, tigers, elephants, lions and many other powerful and fierce animals. There was living contemporaneous with them

a much weaker animal, that had neither the claws, the strength, nor the speed of the tiger. In fact this human animal was almost defenseless. Had a being from another planet been asked to prophesy, he would undoubtedly have said that this helpless animal would be the first to be exterminated. And yet every one of those fierce creatures has succumbed either to the change of climate or to man's inferior strength. The reason was that man had one resource denied the animals, the power of progressive thought. The land sank, the sea cut off England from the main land, the climate changed, and even the strongest animals were helpless. But man changed his clothing with the changing climate. He made fires; he built a retreat to keep off death by cold. He thought out means to kill or subdue the strongest animals.''

This illustration is not to show that animals do not think, but to show how feeble must be their thinking when compared with man's *progressive thinking.*

Thinking Involved in All Knowing.—It is easy for the psychology student to fall into the habit of thinking that the stages of knowing develop chronologically; that at first the mind sense-perceives for a time, then remembers for a time and then imagines for a time and so on. Such of course is not the nature of the mind's activity in the stages of knowing. The mind acts as a unity in any stage of knowing. That is to say, every stage of knowing has every other involved in it in some way. No such a thing as one stage in isolation, sense-perception, or memory, for instance, exists. One stage has one pre-

dominating element, though, and another stage another predominating element.

Thinking in Sense-perception. — Thinking is involved in sense-perception. It is noticeable that the chief element in thinking is *comparison,* and it will be remembered that the chief thing the mind does in sense-perception is to *interpret the sensations.* Interpreting sensations is seeing the likenesses and differences between the present and past sensations. Seeing the likenesses and differences between the present and past sensations is comparison, the chief element of thinking. Therefore, *thinking is involved in sense-perception.*

Thinking in Memory.—In memory the mind retains the effect of its experiences and reacts and *identifies* them. The element that insures that the process will be memory is identifying. Identifying is seeing the likeness between the present experience and the past and knowing that the mind has had the experience before. Seeing the likeness is comparing, the chief element in thinking. Therefore, *thinking is involved in memory.*

Thinking in Imagination.—In that class of imagination which was studied and called the constructive, the mind selects the images of the reproductive and mechanical imagination and adapts them to their position in the complex image. In selecting and adapting the mind compares the images so as to get the ones best adapted. But comparison is thinking. Therefore thinking is involved in the constructive imagination.

Conception.—The first stage in the development of knowing which helps to make up thinking is *conception.*

An idea has previously been defined as *the smallest mental product corresponding to anything as a whole.* Ideas are made of attributes, and a single idea, while most usually made up of several attributes, may consist of a single attribute.

For instance, the idea table has in it material, form, color, size, weight, purpose, etc., but take these away and we have destroyed the idea, *table.* The idea, whiteness, is made up of the one attribute only. Some ideas are made up of attributes that enable the mind to know the object to which they refer from all other objects; some are made up of only one attribute, and some are made up of the common attributes of a group of objects.

The mind's process in forming the idea made up of the common attributes of a group of objects is called *conception.* One's idea of a bird is an idea obtained through conception. In this idea, we find *vertebrate, biped, egg-laying, feather-producing,* etc., attributes common to all birds.

From the above the formal definition of conception is:

Conception is the mind's process of forming ideas made up of the common attributes of classes of objects.

The Logical Steps in Conception.—The mind takes five logical steps in the process of conception.

First, the mind examines a number of particular objects; that is, it senses them by one or more of the senses. It may see, hear, touch, taste, or smell them.

In short, the mind gets some kind of idea of each one through the senses.

Secondly, the mind sees how the particular objects studied in the first step are alike and different. It does not see these likenesses and differences simultaneously in all the objects, but takes them up in succession.

Thirdly, the mind centers its attention upon the attributes which one of these objects possesses, and which every other one possesses; that is, upon the common attributes, and drops out of consciousness the objects with their particular attributes. That is to say, the mind draws away the common attributes and changes them in consciousness from attributes to objects of thought.

Fourthly, the mind thinks that these common attributes which it has known as belonging to the particular objects which it has examined belong to many others; that is, to the whole class.

Fifthly, the mind would give this class, or general idea, a name if it should not have one, but in most cases of conception, the class has a name, so the mind merely *thinks* the name.

These five logical steps in conception are called:

1. Examination of particular objects.
2. Comparison.
3. Abstraction.
4. Generalization.
5. Denomination.

Examination of Particular Objects.—There was a time in the life of each one of us when he did not know

what a bird was, but every one of us now has an idea of a bird. If we got our idea in a natural way, we saw or heard, or touched, possibly, a first bird, a second bird, a third bird, and so on. Each of these birds was distinct, separate from all things, so was particular. The mind must have gone through similar steps in getting its general ideas of the various classes it knows, if it got these ideas naturally. And this is what is meant by the examination of particular objects.

Comparison.—When the mind examined the first bird, if it formed any idea of a bird, it probably had some attributes in this idea not to be found in all birds, possibly some particular color. But the next bird, and the next, and so on were seen not to contain some of the particular attributes, because the mind compared these with the first one known, and the third with the second, and so on. This process of seeing the likenesses and differences of the first, second, third and fourth, etc., is the process of *comparison.* In the case of birds some of these likenesses are (1) backboned; (2) warm blooded; (3) oviparous; (4) feather producing; (5) bipededness.

Abstraction.—The word *abstraction* is from *ab,* meaning *from,* and *traho,* meaning *I draw.* The form *tractus,* the participle of *traho,* means *drawn.* The *ion* means *act of.* So abstraction means literally *a drawing away.* So the triangular question is, what is drawn away, from what is it drawn, and what does the drawing? In conception the *common attributes* are the things which are drawn away, and they are drawn away

from the *particular objects* examined in the first step. The mind draws them away and changes them from attributes to mental objects. So abstraction in conception may be defined as follows:

Abstraction in conception is the mind's process of taking the common attributes away from the particular objects studied and changing them to mental objects.

Generalization.—In conception the mind selects the common attributes of the particular objects examined and naturally thinks that these attributes belong to all the objects of that kind, including those the mind has not examined. For instance, the mind has examined, may be, one hundred squirrels and has found that they all climb trees, and now thinks that squirrels, that is, all squirrels, climb trees. This process of thinking that what is true of particular cases is true of the whole group, is the mind's process of generalization. The following is the definition for it:

Generalization is the mind's process of extending the common attributes of the particular objects studied out to all the objects of the class.

Generalizing too Quickly.—It is quite possible to generalize too quickly; that is, from the study of too few particular objects. This, of course, leads the mind into error. For instance, if one should study snakes, and would examine a rattlesnake, and find poison glands and fangs; then a copperhead, and find poison glands and fangs; then a southern moccasin, and find poison glands and fangs, he might generalize that snakes, that is, all snakes, are venomous. But such a generalization

is erroneous. As a matter of fact, most snakes are not venomous.

Generalizing from One Particular.—It has been questioned whether the mind can generalize from the study of one particular. The mind can and often does do so. The writer has seen but one Gila Monster, which he dissected some years ago. It was found to be a lizard in many respects, with poison glands and fangs, oval eyes, thick stout head, fangs in lower jaw and some fifteen or sixteen inches in length. From this one case, his mind thinks of Gila Monsters as vertebrates, reptiles, venomous lizards. Many similar cases of generalizing from one particular may be found in any one's life.

Generalizing and Accurate Thinking.—There is a close connection between good generalizing and skill in thinking. One who lacks skill in thinking will generalize often with respect to contingent, or accidental attributes, whereas the skillful thinker is very careful about generalizing with respect to such attributes, but pushes out quite boldly with respect to essential and fundamental attributes. For instance, no careful generalizer would feel safe, after having seen only fifty red squirrels, in asserting that all squirrels are red, because red color is not a fundamental characteristic of squirrels. But he would feel safe in asserting that all squirrels are vertebrates, quadrupeds, and rodents. He could make this last generalization from the study of one squirrel and be safe.

Humanity had generalized for a long time that all swans were white, and then black swans were found in

Australia. The generalization was with regard to a non-essential attribute.

Herbert Spencer's wonderful ability as a thinker lay largely in his marvelous power of accurate generalization.

Denomination.—In case the mind were studying a class of objects without a name, the last step in conception would be to give the class a name; that is, associate some name with the class. In this way somebody's mind must have given all classes names. But in most cases the class one is getting the idea of in conception was named many years ago. So in most cases the last step in conception is merely *thinking the name* of the class.

The value of the name of the class is greater than one at first might think. It is very much like the label on the different articles which the druggist has on his shelves for sale. It enables the mind to remember and think about its general ideas without confusing them.

The Product of Conception.—The product of conception is an idea. This idea has several names. It is called a *concept,* a *general idea,* a *general notion,* or a *type idea.* This idea is made up of a number of the common attributes of a class of objects. It is always made up of more than one common attribute but is never in all probability, made up of all the common attributes of a class of objects. It hardly seems possible that any one has all the common attributes of any class of objects, however well known, in his concept of that class. One

never knows any class so well as that. The following is the definition for a concept:

A concept is an idea made up of a number of the common attributes of a class of objects.

The symbol of the concept is the common noun; that is, the common noun expresses the concept. Thus, *horse, tree, house, book, desk, apple, cherry, man, boy, girl,* etc. are symbols of one's concepts of these things.

Aspects of the Concept.—The mind can look at the concept from two points of view. First, it may think of how many common attributes there are which make up the concept. Secondly, the mind may think of how many particular objects the concept is the type of. These two aspects of the concept are respectively called *intension* and *extension.* Other terms used interchangeably with intension are *intent* and *content.* Another term used interchangeably with extension is *extent.* If the mind is thinking of the number of common attributes in the concept, as, for instance, the number of common attributes in the concept, *triangle,* it is thinking of the intension of the triangle. It may be stated as follows:

The intension of a concept is that aspect of the concept which refers to the number of common attributes that make it up.

If the mind thinks of the number of particular objects which the concept is the type of, it thinks of the extension of the concept. It may be put as follows:

The extension of a concept is that aspect of the concept which refers to the number of particular objects of which the concept is a type.

A large extent to a concept necessitates a smaller content than a smaller extent. Thus the concept, *triangle,* has a larger extent than the concept, *isosceles triangle,* but the isosceles triangle has a larger content than the triangle. Again the concept, *horse,* has a larger extent than the concept, *draft horse,* but the draft horse has a larger content than horse. The concept, *mosquito,* has a larger content than the concept, *insect,* but a smaller extent. Increasing the content of the concept may thus decrease the extent, or increasing the extent may decrease the content.

The Two Views of the Concept.—The term, *concept,* is used in various ways by writers on psychology and philosophy, but a study of these ways will show two pretty definite uses of the term indicating the two following views: 1. The popular view. 2. The scientific view.

Popularly, the term is used interchangeably with the term, *idea.* In this sense there are particular concepts and general concepts. In this sense, one's idea of Napoleon, one's idea of flowers, of truth, of gravitation, of religion, of anything whatever, real or ideal, actual or imaginary, physical or mental, is a concept. This is a broad vague view of the concept, not sufficiently definite for much scientific help.

Scientifically, the term, *concept,* is used just as we have been using it in these studies, to mean an *idea made up of a number of the common attributes of a class of objects,* or as some writers call it, a *type idea.*

Formation of Concepts in Actual Life.—In actual

life concepts are formed as follows: the mind observes some objects of a class for the first time and gets a sort of tentative, or trial, concept which usually contains attributes not possessed by all the objects of the class; then the mind observes other objects of the same kind and begins to drop from the concept any attributes which are not common and perhaps to add some common attributes not at first observed; and this process of changing the concept because of further experience is continued until just those attributes which belong to each object of the class remain.

Illustration.—The mind naturally gets its general ideas from the observation of particular objects. Suppose the first barn a child sees is a square one, painted red, with roof sloping but one way, and containing only hay and corn. From this particular object, the mind's concept of barn will contain *square form, red color, a roof sloping but one way,* and *filled with hay and corn.* To be brief, the mind from the study of particular objects goes on correcting its concept of barn by dropping out attributes, and possibly adding some, until just those attributes remain which are possessed in common by barns.

This is the mind's natural way of forming its concepts in life. When it examines the first particular object it forms a trial concept taking all the logical steps. Then it examines another particular object and again repeats all the logical steps to correct this tentative concept, and the mind thus goes on till the concept becomes pretty accurate.

Ideas.—The idea was studied to some extent under sense-perception. It was found there that the term, *idea,* is pretty general, and often vague in its application, but that it is *the smallest mental product corresponding to anything as a whole.*

It seems that it might be helpful at this stage of the study to discuss the classes of ideas to a limited extent.

Classes of Ideas.—Some ideas are formed from the particular attributes of some objects, as one's idea of Thomas Jefferson, or one's own hat; some are formed from the common attributes of classes of objects, as one's idea of city, or child; some are formed from taking a single attribute away from an object or objects and changing it from an attribute in the mind to a mental object, as, one's idea of whiteness or roughness.

Thus, from the way the mind forms the ideas, there are three classes of ideas: 1. Particular. 2. General, or concept. 3. Abstract.

Particular ideas are made up of the attributes of particular objects; general ideas are made up of the attributes common to a group of objects, and an abstract idea is made up of a single attribute thought away from an object or a group of objects and changed in the mind to a mental object.

Again, some ideas correspond to objects, as one's idea, *hill,* or one's idea, *automobile;* some ideas correspond to attributes, as one's idea, *new,* or one's idea, *large;* and some ideas correspond to relations, as one's idea of the connection between an explosion and the re-

port, or one's idea of the conection between oxidation and heat.

Thus, on the basis of what they correspond to, there are three classes of ideas: 1. Substantive ideas. 2. Attributive ideas. 3. Relational ideas. Substantive ideas correspond to objects; attributive ideas correspond to attributes, and relational ideas correspond to relations.

Thirdly, some ideas exist singly, as one's idea, *book*, or one's idea, *sun;* some exist in groups taken as one thing in which one is more important than the others, as one's idea, *a large white house,* or *an honest, courteous man,* and some are made up of two or more ideas of equal importance connected by some relational idea, as one's idea, *bread and butter,* or one's idea, *industry and honesty.*

Thus, on the basis of form, there are three classes of ideas: 1. Simple ideas. 2. Complex ideas. 3. Compound ideas. Simple ideas exist singly; complex ideas exist in groups containing one or more ideas of greater importance than the others, and compound ideas consist of two or more ideas of equal importance connected by one or more relational ideas.

Conditions of Concepts.—One's concepts are conditioned by his experience. One who has only limited experience will find his concepts limited in number and limited with respect to accuracy, while one of wide experience has opportunity for many more concepts and for much more accurate ones.

The following from Mr. Halleck illustrates this

point: "A certain Norwegian child ten years old had the quality *white,* firmly imbedded in his concept *man.* Happening one day to see a negro for the first time, the child refused to call him a man, until the negro's other qualities compelled the child to revise his concept and to eliminate whiteness. If that child should ever see an Indian or a Chinaman, the concept would undergo still further revision. A girl of six, reared with intemperate father and brothers, had the quality of *drunkenness* firmly fixed in her concept of man. Another boy, until in his teens, thought that man was a creature who did wrong not from determination but from ignorance; that any man would change his course to the right path, if he could only understand that he was going wrong. Happening one day to hear of a wealthy man who was neglecting to provide comforts for his aged mother in her last sickness, the boy concluded that the man did not know the mother's condition. When he informed the man, the boy was told to mind his own business."

The Concept and the Image.—The mind can not image the concept, for to do so would require an image which contains only the common attributes of a class. No such image can be made. No one can image a horse which consists of only the common attributes of horses. The image of a horse must have some color in it, and there is no color common to all horses. Every image is a particular thing. Every concept is a general idea, or a type idea.

It is, of course, true that the mind can form an

image which will contain all the attributes which make up a concept, but it also always contains more than the concept; that is, some particular attributes. This is not imaging the concept, it is embodying a concept in an image, which has more attributes in it than those possessed by the concept.

Advance of Conception in Development.—Conception is a higher stage of knowing than sense-perception, memory or imagination. It's development consists in one thing: *The mind in sense-perception, memory and imagination deals predominantly with particular ideas while in conception it deals with general ideas.* This is a large widening of the relations grasped, for general ideas are so much wider in application than particular ideas. Thinking with them saves a vast amount of time and energy for the mind.

"It is evident that the conceptual type of behavior is more economical than the perceptual type, since the former extends its meaning over a much wider field of experience than does the latter. It is therefore highly important that rational thought make use of the conceptual mode of thinking, as, indeed, it does to a very large extent."

Read:

1. Colvin and Bagley's Human Behavior, pp. 306-307.
2. Dewey's Psychology, pp. 204-213.
3. Angell's Psychology, pp. 206-222.
4. Pillsbury's Essentials of Psychology, pp. 220-228.
5. Halleck's Psychology, pp. 183-191.

CHAPTER XVI.

Definition.

Nature of.—The next stage in the development of knowing after conception is definition. This is not treated by many psychologists as a separate stage of knowing and many do not treat it at all. But since it has characteristics which clearly separate it from any of the usually accepted stages of knowing, it seems better to consider it a separate stage.

Views of Definition.—There are more or less generally held two views of definition. That held by people who have not made a very careful study of definition, which may be termed the *popular view,* since most people hold this view; and that held by people who have made a scientific study of definition, which may be termed the *scientific view,* since scientists hold this view.

The Popular View.—The popular view of definition is that definition is some kind of formal statement, oral, written, or printed, to be learned and committed to memory for future use; the idea being that it may help one at some time in some distressing situation by enabling him to remember or to think out some desired knowledge. This view regards definition as a *product,* and a *physical* thing.

It is probable that ninety-nine out of every hundred persons when they think and speak of definition, think

and speak of it according to the popular view, in nearly every instance.

"Definitions are usually treated as mere formal statements to be recited and lodged away in memory, rather than thought processes in fundamental forms of mental activity."

The Scientific View.—Definition in this more fundamental view is a *mental process,* the mental process which lies back of the formal statement, definition as a physical product. The psychology student is interested in the mental process of definition much more than in the physical product.

An examination of the mind's process of forming a definition under natural conditions will reveal the nature of definition.

Let the thing to be defined be the triangle. The mind examines a particular triangle noting its attributes; then it examines a second particular triangle, noting its attributes; then a third, and so on. The mind selects out from these particular triangles just those common attributes that enable it to perfectly definitely think what a triangle is. That is, it selects the common attributes *essential* to the definition of the triangle—the *essential common attributes.* It finds them to be the following:

1. The triangle is a polygon.
2. It has just three sides.

The mind now thinks these two essential common attributes of triangles together in the form of a thought; that is, the mind makes a *synthesis* of them in the form

of a thought, which is as follows: *A triangle is a polygon having just three sides.* This, it is evident, is a definition of the triangle, and the mind's process of making this synthesis is the mental process of definition. This put in the form of a definition is as follows:

Definition is the mental process of making a synthesis of the essential common attributes of a class of objects in the form of a thought.

That the synthesis is made in the form of a thought may be known from the fact that the language unit which expresses the definition is a *sentence,* and the sentence is well known to express a thought. So the form of the mental product, a definition, is that of the thought.

Illustration.—The mind's natural process in defining the noun must have been as follows: it examined several particular nouns in sentences and found the following to be true of each:

1. It is a substantive word.
2. It names the idea of an object.

The mind then made a synthesis of these truths as follows: *A noun is a substantive word which names the idea of an object.* This process though is defining the noun.

The process of making the synthesis of the essential common attributes in definition is analyzable into three smaller steps as follows:

1. The mind acts the name of the class to be defined.

2. It puts the class to be defined into the next larger known class.

3. It sets the class to be defined off from all other classes within the larger known class.

Illustration.—All language is known to be made up of three language units, the *word,* the *sentence* and *discourse.* So, a good definition for the sentence may be stated as follows: *The sentence is that language unit which expresses a thought.* In this definition of the sentence, "*The sentence*" shows the mind has acted the name of the class to be defined; "*is that language unit*" shows the mind has put the sentence, the class to be defined into the class, *language units,* the next known class larger than the sentence; and "*which expresses a thought*" shows that the mind has set the sentence, the class to be defined off from the *word* and *discourse,* the other classes within the larger known class, language units. For the word expresses an idea and discourse expresses a series of coherent thoughts.

What is Defined.—The mind always defines a class, never a particular object. When the mind defines the adjective the definition is for all adjectives; that is for the class, *adjective.* When the mind defines the prism, the definition is for all prisms; that is, for the class, *prism.* And so with the definitions for triangle, cylinder, bird, reptile, and fish.

There seems at first thought to be exceptions to this truth in definitions for such ideas as *character, faith, honor, culture,* etc., but a little analysis causes the seeming exceptions to vanish. The triangle the mind defines

is made up of one, two, three, four and so on instances of the idea defined. It is these instances that make up the class. So in the definition of the idea, faith, it is instance one, instance two, instance three and so on that make up the idea *faith* which is defined.

Definition Must Be Inclusive and Exclusive.—In logical definition all of the particular objects of the class defined must be included. That is to say, the definition must be of an idea which is a type of every particular object of the class. Thus the definition of a bird, *A bird is an animal that grows feathers,* is *inclusive,* for every bird grows feathers. It fits them all, so to speak. But the definition so called, *A bird is an animal that flies,* is not inclusive, for ostriches and some other birds do not fly. Such are, strictly speaking, not definitions, but merely inaccurate attempts at definition.

Again definitions must exclude all objects except those in the class defined. The definition, *A bird is an animal that grows feathers,* is exclusive, for there is nothing but birds which grows feathers. But the definition, *A bird is an animal that flies* is not exclusive, for there are other animals that fly. Bats, butterflies and so on, fly. Definitions to be logical and accurate must thus be *inclusive* and *exclusive.*

Logical Steps in Definition.—The logical steps in definition, deduced from the above study are as follows:

1. The mind examines particular objects of the class to be defined.

2. The mind selects out the essential common attributes of these objects.

3. The mind makes a synthesis of these common attributes in the form of a thought by:

a. Acting the name of the class to be defined.

b. Placing the class to be defined into the next larger known class.

c. Setting the class to be defined off from all other classes within the larger known class.

These steps are, it is seen, general and special. The first two general steps, strictly speaking, are introductory to the third general step, the definition proper, the synthesis of the essential common attributes. The special steps are the steps into which the definition may be analyzed; that is, the steps into which the synthesis of the essential ideas of a class may be analyzed.

Laws of Definition.—There are certain truths of the mind's activity in definition that are always to be found when the process of definition is logical and accurate. These are called the laws of definition and for correct defining are as follows:

1. *The mind must act the name of the class to be defined.*

2. *The mind must place the class to be defined into the next larger known class.*

3. *The mind must set the class to be defined off from all other classes in the larger known class.*

Definitions in harmony with these laws of necessity are logically accurate.

Definition, Description and Synonym.—A clear distinction is to be seen between *logical definition* and *description;* also, between the *statement of a definition* and

a *synonym.* Definition is a limiting process of thought and deals with a class of objects as such. It selects just enough of the common attributes of a class of objects to enable the mind to limit the class; that is, think it perfectly definitely. Description is the mind's process of dealing with a particular object as such, not with a class as such. The mind in description seeks many more attributes than the mind does in definition and the process is not so economical. The mind may, of course, describe a class, but when it does it treats the class as a particular object and not as a class. A difference between a description of a class and a definition is that in the description of a class the mind selects as many attributes of the class as it can, but in definition only enough attributes to limit the class; that is, to think it definitely. Thus definition is not even a description of a class as has sometimes been said.

A statement of a logical definition is to be distinguished from a synonym. The statement of a definition expresses the essential nature of the class defined and is a sentence. A synonym is a word which has the same or nearly the same essential signification as some other word of the same language, and may be used interchangeably with it.

Errors in Definition.—The mind frequently falls into error in definition. This may be seen from the common errors to be found in the statements of definitions in almost all kinds of textbooks. Some of the common errors occur in the following ways:

1. *The attempted definition is untruthful either in*

part or wholly; as, "A sentence is a thought expressed in words," and "The predicate of a sentence is that which is asserted of the subject." In the first case a sentence is not a thought either expressed or unexpressed. The sentence is a physical thing, so much ink on paper, or so much disturbance of the air, while the thought is a mental thing, something in the mind.

In the second case the predicate of the sentence expresses the idea asserted of the idea which the subject of the sentence expresses. The assertion is mental and is between mental things.

So neither of these attempted definitions is true.

2. *The attempted definition is not helpful;* as, "A noun is the name of an object." This in reality is no definition at all. There are no names that are not names of objects, if one puts the right meaning in the term object. So "an object" adds nothing to the meaning, and the definition is *a noun is a name,* but so is a name a noun, and the thought goes in a circle. The mind is not advancing in such attempts at definition.

3. *The attempted definition is not inclusive;* as, "The subject of a sentence is the name of that of which something is thought." This definition is true of subjects of sentences only when they are nouns, not when they are pronouns. In the sentence, *He is free, whom the truth makes free,* "He," the subject does not name at all. The attempted definition does not include subjects of sentences when they are pronouns, so is not inclusive.

4. *The attempted definition is not exclusive;* as

"An adjective is a word which modifies a noun or pronoun." Nouns and pronouns used as possessives modify the noun, and the appositive modifies the pronoun, and according to the above definition would be adjectives; that is, they are not excluded by the definition. In the sentence, William's father lost his fortune, both "William's" and "his" modify nouns, but neither is an adjective. This attempted definition is evidently not exclusive.

Value of Definition.—The value of exercise in logical definition as an aid in the development of knowing is not likely to be overestimated. While it is probably true that to help in good thinking in any system of thought the exercise in logical definition must be in that system, it is beyond doubt that definition is a great intellectual developer. One who is accurate in logical definition in history is certain to be a good thinker in history. One who is accurate in logical definition in sociology or ethics is certain to be a good thinker in these subjects. Slovenly thinking and accurate definition are incompatible. Thus logical definition is an exercise of the highest value in education.

"It is a process of thinking which brings into unity the individual and universal—the problem of all thought, and which brings the learner into unity with the world of thought, the end of all learning. This is its primary educational value.

The power to discern unity in the midst of diversity; to detect essential likenesses amidst engrossing and non-essential differences; to find the enduring under the

mask of obtruding, accidental, and superficial attributes, is a fundamental characteristic of every well-trained mind. To define is not simply to unify individuals; but, in unifying, to find their essential nature. The common nature in which they are unified is the essential nature of each individual. Hence the habit of thinking in the form of definition is the habit of thinking the true nature of things; which is the primary function of the mind.

This unifying act of mind is complex; and has a richer significance in training than at first appears. It requires accurate, thorough, and methodical observation; precise discrimination through comparison and contrast; abstraction of that which abides after differences have been cancelled; and generalization, by holding in mind the differences of individuals while binding them into the unity of their common nature. So that while training to correct habits of definition, the teacher is carrying forward a large number of related habits. Too much cannot be said, therefore, by way of urging the teacher to train the student in the power of logical definition; since it is a form of activity by which he comes into unity with the world of thought."—Tompkins.

Why the Mind Defines.—The mind defines in thinking the world, physical and spiritual, in which we live. The mind's defining is not an accident, but is because of some need. This need is the need for definiteness. When the mind makes its maximum effort to think the essential nature of a thing definitely it thinks it in the

form of definition. So the mind defines in order *to reach its highest efficiency in thinking the essential nature of a thing definitely.*

Advances of Definition.—Definition is a higher stage in the development of knowing than conception. Its advances over conception are as follows:

1. Definition is more definite than conception.

2. Definition is more economical than conception.

3. Definition is more discriminating than conception; it enables the mind to distinguish between the essential and the non-essential.

That definition is more definite than conception is evidenced in the fact that we all have concepts of many things which we can not define. Each one of us has a concept of a hat, stove, horse, and so on, but it is probable that most of us cannot define these ideas without further study. We can not define them because we have not thought them sufficiently definitely.

That definition is more economical than conception appears in the fact that in conception the mind deals with as many common attributes as it can discover, but in definition it deals with fewer, only the essential ones, and yet it knows better the general idea in definition than in conception. This saves the mind's time and energy.

That definition is more discriminating than conception we know, because the mind must differentiate the essential common attributes from the accidental, con-

tingent or non-essential. This differentiating makes the idea of the class defined stand out in bold relief—a very necessary thing in definition.

Read:

1. Thompkin's Philosophy of Teaching, pp. 186-193.

CHAPTER XVII.

Judgment.

Character of Stages of Knowing. — Some of the stages of knowing may be seen to be *idea-forming* stages, some to be *conserving* stages and some to be *relating* stages, predominantly. In sense-perception the mind forms ideas of particular, material external objects—*percepts.* In conception the mind forms ideas made up of the common attributes of classes of objects—*concepts.* So *sense-perception* and *conception* are the *idea-forming* stages in the development of knowing.

In memory the mind forms no new ideas but conserves the effects of one's experiences, reacts and identifies them. In imagination the mind, strictly speaking, forms no new ideas but embodies its ideas in images. This helps the mind to remember its ideas and to work with them in thinking. So while imagination is not so strictly a conserving stage of knowing as memory, its main function is conservative. Thus *memory* and *imagination* are predominantly *conserving* stages in the development of knowing.

In definition the mind is chiefly concerned in grasping and making a synthesis between its general ideas. It also discriminates very definitely between ideas of classes; that is, between general ideas. All this is the mind's way of emphasizing the process of grasping relations.

In judgment the mind carries this process of grasping relations a little further than it does in definition, which will appear a little later in these studies. Each of the remaining stages of knowing, up to *intuition*, further engages the mind's process of grasping relations, which also will appear a little later in these studies.

So *definition, judgment, reasoning*, and *systematization* are predominantly *relating* stages in the development of knowing.

Distinguishing Elements in the Stages of Knowing. —Each stage in the development of knowing, while involving every other stage, has something in it which enables one to know it from every other stage; that is, distinguishes it from every other stage. This element is the distinguishing element. The following will formulate:

The distinguishing element of any stage of knowing is that element which enables one to know it from any other stage.

In Sense-perception. — The distinctive thing the mind does in sense-perception is to *interpret sensations.* It matters not what one may be doing, he may be translating a sentence in Latin, he may be observing an experiment in chemistry or physics, he may be solving a problem in trigonometry or algebra, he may be identifying a specimen in botany, zoology, or geology, just in so far as he is interpreting the sensations, so much of the process is sense-perception.

The distinguishing element in sense-perception is the interpretation of sensations.

In Memory.—The distinctive thing the mind does in memory is to know that it has had the experience before. The mind retains in memory, it reacts in memory, and it identifies in memory, and it would seem that any one of these three elements would distinguish memory from the other stages of knowing. But one frequently retains without remembering, and he also frequently reacts without remembering, so while these two elements are distinctive to memory the act of memory is not complete with them. They do not guarantee that the mind is remembering. But if the mind is knowing that it has had the experience before, the activity is always one of memory. This knowing that one has had the experience before not only separates memory from the other stages of knowing, but it is the essential element of memory, and also the distinguishing element of memory.

The distinguishing element of memory is the identification of the present experience with the past.

In Imagination.—In imagination the mind forms images *freely.* In memory the mind forms images, but lacks freedom in doing so. One must react the experience accurately, and inability to do so detracts from the efficiency of memory. No memory is regarded good beyond the degree to which one reacts the experience accurately. And when an idea, this more or less accurate idea may by the imagination be embodied in an image. But this imaging is limited by the necessities of memory.

In imagination the imaging is free. Any amount of changing, idealizing, does not detract from the effici-

ency of the act of the imagination. The mind is conscious of this and works in imagination under the influence of this consciousness.

The distinguishing element in imagination is the free imaging activity of the mind.

In Conception.—In conception the mind deals predominantly with common attributes of groups of objects. Conception is the *class-forming* stage in the development of knowing. To form ideas of classes the mind must see the common attributes of the class which do not extend beyond the class and also which do not belong to other classes. That is to say, it must grasp the class common attributes. For instance, in forming a concept of birds the mind sees they are *animals, vertebrates,* and *bipeds,* but these common truths are not distinctive of birds. They are universal common attributes. But feather-growing is a distinctive attribute of birds; it is a class common attribute, and this is what the mind emphasizes in conception.

The distinguishing element in conception is grasping the class common attributes of a class of objects.

In Definition.—In definition the mind selects the essential common attributes of a class of objects and thinks them into a thought. It is not interested in all the common attributes of a class of objects, but just those necessary to enable it to think the idea of the class perfectly definitely. And it thinks the class as definitely as it is able to do by making the synthesis of these essential common attributes in a thought. This is the dominant and distinguishing thing in definition.

The distinguishing element of definition is the synthesis of the essential common attributes of a class of objects.

Judgment.—Judgment is the next stage in the development of knowing after definition. In this kind of mental activity the mind grasps and asserts the relation between ideas. In sense-perception the mind gets particular ideas, in conception it gets general ideas, and abstract ideas in abstraction. In judgment the mind grasps and asserts the relations between them.

For example, the mind of man had general ideas of *coal* and *fuel* for years before it ever grasped the relation between them. When at last it grasped this relation it asserted that *coal is a fuel.* This process of grasping the relation between the idea, *coal,* and the idea, *fuel,* and asserting it is the mind's process of judging. The formal definition of judgment is thus as follows:

Judgment is the mind's process of grasping the relation between two ideas and asserting it.

In judgment the mind takes the ideas by twos. The ideas may be simple; as, *Man is mortal;* they may be complex; as, *That distinguished hero is also a poet of renown;* or they may be compound, as, *Bread and butter is healthful and nutritious.* But in any event the mind groups them by twos in judgment.

In judgment the mind may assert the relation between any two kinds of ideas; that is, between two particular ideas; between two concepts; between two abstract ideas; between a concept and an abstract idea, and between a particular idea and an abstract idea.

The definition of judgment that *it is the mind's process of grasping and asserting the relation between concepts* is not accurate, unless one uses the idea concept in the popular sense. It is not inclusive.

The idea, *assert,* is an idea usually only vaguely understood, yet it is much used in both psychology and grammar. An analysis of assertions which all agree are assertions reveals the fact, first, that all assertions are mental things; *relations* between experiences, and are in the mind; secondly, that such a relation can be opposed or defended, and that where the assertion is lacking there is nothing to defend or oppose. For instance, *the large tree* does not express an assertion, neither does it express anything to be denied or defended, but *the tree is large* expresses an assertion. It also expresses a relation which can be opposed or defended. From which the following statement for an assertion is reached:

An assertion is a relation of such a character that it admits of opposition or defense.

The Steps in Judgment.—The act of judgment is a *triple* activity of the mind; that is, a one act made up of three. Each one of these three acts is a step in judgment, and they are as follows:

1. The mind acts the idea of some object as an undifferentiated whole.

2. The mind brings into consciousness some related idea.

3. The mind grasps and asserts the relation between these two ideas.

Illustration.—In the judgment, *Peaches are fragrant,* the mind acts the idea, *peaches,* just as a whole thing, at this stage no element being separated from the idea, peaches; that is, as an undifferentiated whole. Then the mind brings into consciousness the idea, *fragrant,* and lastly it asserts the relation between these ideas.

Product of Judgment.—The product of an act of sense-perception is a *percept;* of an act of conception, a *concept;* of an act of definition, a *definition;* of an act of judgment, a *judgment.* Judgment is thus both a process and a product. It has previously been defined as a process and may be defined as a product as follows:

A judgment is a mental product which the mind reaches by asserting the relation between two ideas.

Judgments as products are thought of as *negative* or *positive,* depending upon the character of the relation asserted. Thus the sentence, *The building is not beautiful* expresses a negative judgment, and the sentence, *The fragrance of the rose is delightful* expresses a positive judgment.

Elements of the Judgment.—Each judgment consists of three essential elements resulting from the three activities making up the judgment. They are called (1) the *psychical subject;* (2) the *psychical predicate,* and (3) the *psychical copula.*

Each of these is an idea; the psychical subject the idea of which something is asserted; the psychical predicate that which is asserted, and the psychical copula is

the assertion. The following are the formal statements for them:

The psychical subject is the idea of which something is asserted.

The psychical predicate is the idea which is asserted of the psychical subject.

The psychical copula is the assertion between the psychical subject and the psychical predicate.

Judgments of Intension and Extension.—There are two reasons why the mind would use any judgment, which may be seen from the following. Suppose the judgment were *Dogs are useful,* the mind might have the abstract idea, *useful,* in consciousness and might be thinking of the various things possessing this attribute; it might think horses are useful, cows are useful, houses are useful, books are useful, and dogs are useful. In this case the mind thinks the judgment in order to enlarge the extent of the idea *useful.*

But suppose the mind were thinking all the attributes of dogs that it could, and would think, dogs are faithful, dogs are strong, dogs are friendly and dogs are useful, it would think dogs are useful to increase the intent of the idea, *dogs.*

These two reasons of the mind for thinking a judgment give grounds for the two aspects of judgments: 1. *Intension.* 2. *Extension.* Other terms are, for intension, *intent* and *content;* for extension, another term is *extent.*

These are frequently spoken of as *judgments of intension* and *judgments of extension.* But they are but

two aspects of the same judgment, and every judgment may be a judgment of extension and a judgment of intension at one time, depending upon the mind's attitude toward it.

The following obtained from the above study will formulate these two kinds of judgments:

A judgment of intension is a judgment whose predicate is referred to its subject to increase the intent of the subject.

A judgment of extension is that kind of judgment in which the subject is referred to the predicate to increase the extent of the predicate.

Increasing the intent of the subject is adding to the attributes which make up the idea.

Increasing the extent of the predicate is adding to the number of objects of which the predicate is true.

In a series of judgments of content the subject may remain permanent; that is, the same idea may be the subject of each judgment, while in a series of judgments of extent the predicate may remain permanent; that is, the same idea may be the predicate of each judgment.

Truth.—The mind has an idea of something which it thinks as truth. What truth is *in content* may vary greatly with different minds, but *in form* truth is the same to all minds. Any mind regards that as truth which when asserted in a judgment in no way conflicts with any other judgment of the same mind. If one regards the judgment, *the mosquito is an unmitigated nuisance,* as a truth, it is because he has no other judg-

ments which conflict with the relation asserted in the judgment. The following will formulate this thought:

Truth to each mind is relation asserted in a judgment which is not in conflict with any other judgment of the same mind.

"It must not be thought from this that the mind has any ready-made test existing within it by whose application it can decide upon the falsity or truth of any judgment. There is no simple criterion or rule for determining truth which can be applied immediately to every judgment; the only criterion is relation to the whole body of acquired knowledge, or the acquired system of relations, so far as it is realized. The worth of the criterion will evidently depend upon the degree in which the intelligence has been realized and knowledge acquired."

Belief.—Belief is perhaps feeling rather than knowing; that is, emotional rather than intellectual. But belief is always founded on judgment. The judgment acts and belief accompanies it.

"To believe a thing is to regard it as true. The most important point regarding the psychology of belief is the recognition that it is not a separate state of mind over and beyond the judgment, but is a necessary accompaniment of it. Every act of intelligence, every assertion, that is, of a relation, is believed to be true. Intelligence must recognize its own existence, its own workings; and thus recognition is belief."

We believe a thing because in so far as we have tested it with our intelligence, our judgment asserts it

as a reality. This confidence in one's own intelligence is belief. We may formulate it as follows:

Belief is the feeling of confidence in the efficiency of one's own intelligence.

Belief grows out of desire and hope and vivid imagination very easily and unobtrusively because of its emotional nature, unless one applies to his desires, hopes and imaginative pictures the critical action of the judgment.

Doubt.—Doubt is as natural and healthy in the development of knowing as belief. It is the correlation of belief. One must doubt one thing frequently in order to learn to believe the opposite. Both doubt and belief are legitimate accompaniments of the developing intelligence.

"But the mind learns, in growing experience, that not every judgment does agree with the conditions of universal intelligence; that is, it discovers that some of its judgments contradict others. It thus arrives at a state of suspense; it is not sure whether *this particular* judgment agrees or not with itself, with the whole system of knowledge. It learns that a great many, perhaps most of its judgments, have to be corrected with growing experience, and thus it learns to assume a state of suspended judgment. It no longer assumes truth as the child's mind does; it waits for evidence."

Doubt, it appears, is a state of mind in which the mind is not willing to judge because of a possible conflict in its judgments. This thought may be formulated as follows:

Doubt is the feeling of suspense of judgment because of a possible conflict resulting from an act of judgment.

Belief is a pleasant feeling and too often results in a feeling of self-sufficiency that is detrimental to development of the intelligence. Doubt is an unpleasant feeling which stimulates to intellectual endeavor, that the suspense may be removed. Each has its function in the growing intelligence of the individual.

Advance of Judgment.—Judgment is an advance in development over definition, just as we would expect. In definition the mind asserts the relation between general ideas; that is, relations between the idea of some class and an idea of another class made up of the essential common attributes of the class defined. But in judgment the mind asserts the relations between all sorts of ideas—between more kinds of ideas than it does in definition.

The advance of judgment over definition is that in judgment *the mind asserts the relation between more kinds of ideas than it does in definition.*

Distinguishing Element. — The *sine qua non* of judgment is the *assertion.* No assertion, no judgment. It matters not what else the mind may be doing in so far as there is assertion involved, there is judgment involved.

The distinguishing element of judgment is the assertion of the relation between ideas.

Symbol of Judgment.—The sentence expresses the judgment, or is the symbol of the judgment. So the

relation of the sentence to the judgment is that of the symbol to the thing symbolized, and the relation of judgment to the sentence is that of the thing symbolized to the symbol. The judgment and the thought are identical; that is, each has the relation of *identity* to the other. In psychology the proposition is identical with the thought or the judgment.

Read:

1. Dewey's Psychology, pp. 213-220.
2. Angell's Psychology, pp. 223-234.
3. Pillsbury's Essentials of Psychology, pp. 229-232.
4. Halleck's Psychology, pp. 191-194.

CHAPTER XVIII.

Reasoning.

The Stages of Knowing.—Sense-perception begins with a sensation and ends with an idea—a percept; memory begins with any sort of present mental experience and ends by identifying this present experience with some past mental experience; imagination begins with an idea and ends with an image; conception begins by examining a number of particular objects and ends with an idea—a concept; definition begins with the examination of particular objects and ends with a definition; judgment begins with two ideas of any kind and ends with a judgment; reasoning begins with two judgments and ends with a third judgment reached because of the relation between these two.

Nature of Reasoning.—In each judgment there are three ideas involved, and in a somewhat similar way in reasoning there are three judgments involved, and they are so related that the third one is a *conclusion* from the other two, or it is an *inference* from the other two. Thus having the two judgments, *Man is mortal,* and *William is a man,* the mind reaches the third judgment, *William is mortal.* This process of reaching the third judgment through the relation of the other two is reasoning. The definition for it is as follows:

Reasoning is the mind's process of reaching a judg-

ment because of the relation between two preceding judgments.

This act of reasoning is the basis of the principle, "Two things that equal the same thing are equal to each other."

In the act of reasoning following,

Horses are useful.

Maud is a horse.

Maud is useful.

H. =u.

M. = h.

M = u.; that is, u. equals H., M. equals h., therefore, M. equals u.

Classes of Reasoning.—A popular question is, What are the classes of reasoning? and the popular answer is (1) Inductive; (2) Deductive. This popular question is ambiguous because it admits of more than one answer. Any question on the classes of reasoning, to be definite, must give the basis of classification, for there are several different classes of reasoning depending upon the basis chosen.

Implicit and Explicit Reasoning.—The mind often forms a judgment when it is not at all conscious that this judgment is reached because of the relation between two preceding judgments, but analysis always shows that the two preceding judgments are to be found, though not in consciousness. Thus when the mind thinks *this is a rainy day,* it has, as a rule, in consciousness only this one judgment. But an analysis shows that the two judgments, *Rainy days are days having certain*

characteristics, and *This day is a day having these characteristics,* are the two preceding judgments from which the judgment, *This is a rainy day,* was inferred.

But again the mind reaches a judgment from the relation between two preceding judgments, when all the judgments are in consciousness; as when the mind reasons *Dynamite is a violent explosive. This material is dynamite. This material is a violent explosive.*

So on the basis of the number of judgments in consciousness, there are two classes of reasoning: 1. *Implicit reasoning.* 2. *Explicit reasoning.*

The above thought on these kinds of reasoning formulated gives the following:

Implicit reasoning is that kind of reasoning in which one or more of the three judgments are not in consciousness.

Explicit reasoning is that kind of reasoning in which all the three judgments are in consciousness.

The mind uses the implicit reasoning much more than it does the explicit, in the ordinary affairs of life. In the implicit reasoning only one judgment may be in consciousness, and many, many times this is the case; but there are also many cases in which two judgments are in consciousness. Implicit reasoning at first thought, hardly seems to be reasoning at all. A psychological analysis, however, shows the true nature of the process.

Inductive and Deductive Reasoning.—Again the mind in reasoning examines particular objects, discovers the truths of these and reasons from these particular truths to truths of the whole class; that is, to general

truths. It reasons that what is true of the particular objects is true of the whole class, as follows:

These objects are birds.
These objects grow feathers.
Birds grow feathers.

But the mind may start with a general truth and reason that what is true of the whole class must be true of the particular objects of that class, as follows:

Birds grow feathers.
This object is a bird.
This object grows feathers.

Thus on the basis of whether the mind goes from a particular truth to a general truth in reasoning or from a general truth to a particular truth there are two classes of reasoning. 1. Inductive reasoning. 2. Deductive reasoning.

The following are the formal definitions:

Inductive reasoning is that kind of reasoning in which the mind goes from particular truth to general truth.

Ex.—This object has voluntary motion.
This object is an animal.
Animals have voluntary motion.

Deductive reasoning is that kind of reasoning in which the mind goes from general truth to particular truth.

Ex.—Animals have voluntary motion.
This object is an animal.
This object has voluntary motion.

Particular truth is truth which is true of particular objects, or cases. General truth is truth which is true of classes, or of all the cases of a kind.

Basis of Induction.—The term, *inductive reasoning,* for convenience is shortened to the term, *induction;* and *deductive reasoning,* to *deduction.* The question, *What right has the mind to assume that what is true of particular cases is true in general?* suggests itself. This, it is evident, is the assumption of induction, and without this assumption, *that what is true of particular cases is true of all cases of the kind,* there could be no inductive reasoning, nor any other kind of reasoning for that matter.

This assumption has its explanation in conduct or behavior. In the evolution of life those animals whose behavior was in harmony with the law, *that nature manifests itself uniformly,* were the ones who survived and those whose behavior was not in accord with this law perished. The surviving ones passed on to their offspring this nervous reaction to the uniformity of nature's phenomena, and through variation and selection it intensified into *instinct.* This instinct proved so valuable to all animal life that behavior in accord with it has conduced to survival.

Thus *the basis of inductive reasoning is the instinctive assumption that nature's laws are uniform.*

The evidence of the correctness of the assumption is the guidance it gives us in behavior. The one who touches fire and gets burned assumes that it will burn again, if touched. The assumption does well to live by. A tree produces apples one year, and we assume it will produce apples again, not pumpkins, when it produces anything. So the test of the correctness of the assump-

tion in behavior has proved out so well that the assumption has become a habit of mind.

Deduction, Identification and Induction. — There are three judgments in every act of reasoning, and the mind uses a different kind of reasoning in reaching each judgment. This will appear from the following:

Man is mortal.
William is a man.
William is mortal.

In reaching the judgment, *William is mortal,* the mind uses regular deduction, as the above, the conclusion being, *William is mortal.* In reaching the judgment *William is a man,* the mind uses the following, which is called identification:

Man is mortal
William is mortal.
William is a man.

the conclusion being *William is a man.* In reaching the judgment, *Man is mortal,* the mind uses induction, as follows:

William is a man.
William is mortal.
Man is mortal.

the conclusion being, *Man is mortal.*

It is evident that here is basis for three classes of reasoning. So *on the basis of the kinds of reasoning the mind uses in reaching the three judgments in any kind of reasoning,* there are three classes of reasoning: 1. Deduction. 2. Identification. 3. Induction.

The following will further illustrate these classes:

Deduction.

Man is mortal.

Socrates was a man.

Socrates was mortal.

Identification.

Man is mortal.

Socrates was mortal.

Socrates was a man.

Induction.

Socrates was mortal.

Socrates was a man.

Man is mortal.

It is evident that the form of identification given here is not valid reasoning; is not good logic as some would say. If the general truth stated in the first proposition could correctly be put in the negative form, *Nothing but man is mortal,* then the conclusion, *Socrates was a man,* would be valid.

But even though this mode of identification does reach only probably truth, there perhaps is no other kind of reasoning used more by the mind. When one's mind thinks any particular object into a class the chances are nine in ten that it employs this very kind of reasoning. One sees some object and thinks it is a horse, a tree, a house, a man, a book, a dog, a bird, a bee, a boat, etc., etc. and in almost every case the mode of identification illustrated above is used; that is, the mode which leads to only probable truth.

In identification the mind reaches a judgment in

the conclusion which unites some particular object as such with a class as such.

The Syllogism.—For purposes of study in psychology the syllogism may be considered as *the formal act of reasoning thought of as a whole thing.* The syllogism is thus composed of three propositions, or judgments. The first two of these propositions in the syllogism are called the *premises* and the third one is called the *conclusion.*

There are also in the syllogism three terms: the *major term,* the *minor term,* and the *middle term.* As seen above a proposition in the syllogism is a judgment, but a term is always an *idea,* and there are two terms in each proposition, the predicate and the subject of the judgment.

These terms may be known from their position in the judgments. The predicate of the conclusion is invariably the *major term.* Since each term occurs twice in the syllogism, it is also always found in one of the premises. The subject of the conclusion is invariably the *minor term.* It is also always found in one of the premises. The term found in both the premises but not found in the conclusion is the middle term. Thus in the syllogism,

Sponges are animals.
This object is a sponge.
This object is an animal.

the idea, *an animal,* is the major term; the idea, *this object* is the minor term, and the idea, *sponge,* is the middle term.

It is to be seen that the middle term is a medium for comparing the other two. The idea, *sponge,* is a medium for comparing the idea, *this object,* with the idea, *an animal.* This, the fact that it is a medium of comparison, seems to be why it is called the middle term. Of the other two terms the one in the predicate of the conclusion is larger in *extent* than the one in the subject. And this seems to be the reason for the terms *major* and *minor.*

The premises are major premise and minor premise depending upon the terms found in them. The major term is always found in the major premise and the minor term in the minor premise. Thus in the syllogism expressed above, the judgment, *sponges are animals* is the major premise, and the judgment, *this object is a sponge,* is the minor premise.

It was observed above that in the syllogism the mind compares the minor term and major term through the medium of the middle term, that the syllogism is the formal act of reasoning, and that a term is an *idea,* therefore we reach the following definition for reasoning:

Reasoning is the mind's process of comparing two ideas through the medium of a third.

Figures of the Syllogism.—The judgments arranged in a certain order in the syllogism are called a figure of the syllogism. Since the mind in reaching the judgments in any kind of reasoning arranges the judgments in general in three orders, there are three figures of

the syllogism. They are called first figure, second figure and third figure. The following illustrates them:

I.

Animals have voluntary motion.
This object is an animal.
This object has voluntary motion.

II.

Animals have voluntary motion.
This object has voluntary motion.
This object is an animal.

III.

This object is an animal.
This object has voluntary motion.
Animals have voluntary motion.

The first figure of the syllogism is used by the mind in *deduction;* the second by the mind in *identification,* and the third, by the mind in *induction.*

The Distinguishing Element in Reasoning. — In reasoning the mind grasps the relation between two judgments and thereby forms a third judgment. It forms this third judgment from two ideas compared indirectly; that is, through the medium of a third, and this is the distinctive thing in reasoning.

The distinguishing element in reasoning is the comparison of two ideas through the medium of a third.

Advance of Reasoning.—The advance of reasoning over judgment is to be found in the further development of the mind's relating activity. The mind grasps all the relations in one act of reasoning which it grasps in three acts of judgments and in addition what relations

there are between the judgments. This may be put as follows:

1. The act of reasoning is more complex than an act of judgment.

2. The mind grasps relations between judgments in reasoning; in judgment, the relation between ideas.

Read:

1. Dewey's Psychology, pp. 220-231.
2. Pillsbury's Essentials of Psychology, pp. 216-237.
3. Angell's Psychology, pp. 235-255.
4. Halleck's Psychology, pp. 194-203.

CHAPTER XIX.

SYSTEMATIZATION.

Unity of Stages of Knowing.—While our method of study of the development of knowing is necessarily of such a character as to tend to lead one to think that the different stages develop in succession, such is in reality not the case. The development of knowing is a unity, each stage involving to some degree every other stage. The method of exposition in these studies is an *analytic* one, in which the mind abstracts the stages one by one from the unified whole and studies them. The study begins with the stage in which the fewest relations are grasped, sense-perception, and proceeds from stage to stage in the order of the broadening and deepening of the mind's relating activity.

Reasoning in the Lower Stages.—There is nothing that shows this unity of knowing better than to see how reasoning is involved in each stage of knowing from sense-perception to judgment, inclusive.

In sense-perception the mind, as was seen in the study of sense-perception, always classifies the object sense-perceived. This object is always a particular object. Thus the mind unites a particular object with some class. But this asserting that a particular object belongs to some class is identifying the object, and *identification* is one of the classes of reasoning. Usually only one judgment is in consciousness, so the reasoning

is *implicit.* Thus the reasoning involved in sense-perception is *identification* and is *implicit.*

In memory the mind identifies some present experience with some past experience, but this process of identifying is again the reasoning called *identification* and it, too, is usually *implicit.* The syllogism is as follows:

> A past experience has certain characteristics.
> This present experience has these characteristics.
> This present experience is identical with the past, to some degree.

In the constructive imagination the mind forms complex images by adapting the images of the reproductive and mechanical imagination. This requires the adaptation of means to end, and this involves reasoning as follows:

> Images adapted and combined make suitable complex images.
> These are adapted and combined images.
> These make suitable complex images.

The reasoning in this case is *deductive* and *implicit.*

In conception the mind forms general ideas from the study of particular objects; that is, goes from the particular to the general, and this is just what the mind does in inductive reasoning. So *inductive reasoning* is involved in conception.

In definition the mind from the study of particular cases picks out the essential common attributes of them and makes a general assertion of these. This is again going from the particular to the general and is inductive

reasoning. So *inductive reasoning* is involved in definition.

In judgment it appears that the mind may go from the particular to the general, from the general to the particular, or may put the particular object in a class; that is, a judgment may be a conclusion from any kind of reasoning. So *induction, identification,* and *deduction* are involved in judgment. They are always *implicit.*

This is but one of the ways of showing the unity of the stages in the development of knowing.

Nature of Systematization.—The mind in judgment grasps the relation between ideas; in reasoning it grasps the relation between judgments, and in systematization it grasps the relation between acts of reasoning and unifies them into a whole which we call a system. Each truth is what it is, because of its connection with and dependence upon other truths.

"Reasoning is the act of mind which recognizes this dependence, and develops the modes of connection. But reasoning confines itself to the special relations which connect facts. It does not deal with the truth that all these relations are also related to each other, and are factors of one harmonious whole."

It is in systematization that this harmonious whole is made. The following is the formal definition for systematization:

Systematization is the mind's process of grasping the relations among the truths reached by reasoning and forming them into an organized whole.

The Products of Systematization.—In a general way the product of systematization is systematized knowledge. In any department of knowledge, as in the knowledge of plant life, or in the knowledge of animal life, the various truths unified on the basis of an organizing principle constitute a *science.* And all sciences unified on the basis of some inclusive organizing principle constitutes *philosophy.* The mind in systematization does both; that is, unifies the various truths that make the various sciences, and unifies the various sciences into *philosophy.*

Thus the products of systematization are two: 1. *Science.* 2. *Philosophy.* Science is unified knowledge and philosophy is unified science.

"It is in result what we call 'science' and 'philosophy', which are not only knowledge, but coordinated knowledge arranged in connected form. Each special branch of science is one form of this attempt at harmonious system. Philosophy is the attempt to systematize or arrange in their organic unity all special branches of science. No isolated science fulfills the end of knowledge or is complete system, because in it the analytic activity predominates over the synthetic. Science in its completeness, including the synthetic function, is philosophy."

The Distinguishing Element. — The thing which makes systematization different from the other stages of knowing is its wide unifying activity. It unites acts of reasoning into a coherent whole.

The distinguishing element of systematization is

grasping the relations among truths reached by reasoning.

Advance of Systematization.—It is evident that systematization is a further development of the mind's relating activity. In systematization the mind grasps all the relations it grasps in acts of reasoning, and in addition the relations among these relations; that is, the relations among the truths reached by reasoning.

These advances pointedly are as follows:

1. Systematization is more complex than reasoning.

2. Systematization is more elaborate than reasoning.

3. In systematization the mind grasps the relations between the truths reached by reasoning.

The Cultivation of Thinking.—The cultivation of conception, definition, judgment, reasoning and systematization is best studied together under the general head of the cultivation of thinking, because whatever cultivates one of these stages in the development of knowing cultivates all.

Skill in thinking is simply skill in seeing the essential relations of things; that is, seeing the relations between things *correctly* and doing it *readily.* Now the mind can not see relations between things when it does not know things. This is the same as saying the mind can not think unless it has material to think about and to think with. So there are in general two things to be gained in the development of thinking as follows:

1. *The mind must gain a stock of knowledge, facts or ideas and remember them.*

2. *The mind must gain the ability rightly to see the relations between these materials of thought.*

It is well known that ignorant persons can not think well. They have nothing to think about and with. As well expect one to build a house without material and tools as to expect one to think without a stock of knowledge. People with minds potentially good are easily made to believe all sorts of superstitions and other foolish things in the absence of exact knowledge.

Again one may remember facts of knowledge, but if he possesses no ability to trace out their relations rightly he can not think. Indeed one may have a marvelous memory for desultory facts and events and yet be positively stupid in thinking. But combine these two, a mind stored with the essential facts of men and things and the ability to trace out rightly and readily the relations among them and we have a *thinker of the highest order.*

From this study the inference is that cultivation of thinking consists of two things:

1. *The storing our minds with the essential facts of men and things.*

2. *The acquiring the ability to see rightly and readily the relations among these facts.*

The first of these is to be done by the pursuit of subjects in which the essential facts of men and things are to be learned. These subjects are chemistry, physics, zoology, botany, geology, astronomy, geography, physiology, psychology, history, sociology, etc.

The second of these things, the acquiring of ability

in rightly and rapidly tracing out relations, is to be gained from the pursuit of those subjects which require exercise in tracing relations, and the kind of relations one most needs in thinking.

Now it will be remembered that there are two kinds of relations in general: 1. Logical relations. 2. Arbitrary relations. The arbitrary relations are such as those of a *symbol* with the *idea* which it symbolizes, or as the relation between a certain *date* and an *event,* or *crowd* of men and the *number* of men in it.

Logical relations are such as can be woven into a system, and can often be thought out. Some of them are as follows: 1. Relations of identity, or similarity. 2. Relations of whole and part. 3. Quantitative relations. 4. Relations of time and place. 5. Relations of cause and effect. 6. Relations of instrument and end. 7. Relations of purpose and means.

Now those studies which require us to trace out these logical relations are the ones which will improve us in ability to think.

But there is another question here which is called the *question of transfer of training;* that is to say, *how much does training one to think in chemistry, for instance, develop the power to think in history?*

"It is frequently asserted that mathematics trains reasoning, classics memory, and so on. These assertions are based altogether on assumption and apparently assume an out-of-date psychology."—Pillsbury.

So it is not certain that tracing out logical relations in one system of relations, the mathematics system,

for instance, will improve one's ability to think in other systems of thought.

General observation would seem to answer this question in the negative, but at present the question is not fully settled.

This much is true, though, the subjects best to give exercises in tracing out logical relations are: 1. The sciences: chemistry, physics, zoology, botany, physiology, geography, psychology, sociology, etc. 2. The histories and literatures. 3. The mathematics: arithmetic, algebra, geometry, etc.; and others not so good are: 1. Languages: spelling, reading, Latin, Greek, German, etc. 2. Commercial subjects: stenography, book-keeping, typewriting, commercial law, etc. 3. The arts: penmanship, drawing, painting, music, etc.

Now any of these best subjects may be of very little value in developing thinking power if improperly taught. If they are made mere exercises of the memory their value is very small. But, if they are dwelt upon, thought over, recited upon and woven into a system, and organized around some fundamental principles, they will give the learner power of thought, if he is capable of it.

This study would lack something were not the time for the cultivation of thought studied. The answer to the question, when best cultivate thinking? has in a way been indicated already.

One may best acquire the essential facts of men and things in youth and early manhood or womanhood. He

may successfully improve his power of rightly tracing relations any time in youth or adult life.

A summary of the points in this study are:

1. The cultivation of thinking consists of (1) storing one's mind with the essential facts of men and things; (2) in gaining the ability to trace out the relations of these rightly and readily.

2. The first is done by learning and remembering the truths of the subjects dealing with these things.

3. The second is done by studying rightly those subjects which deal with logical relations.

4. No subject is good to give power of thought if badly taught, or badly studied.

5. It is not certain that training in one system of relations gives increased power of thought in another system.

6. Some groups of subjects are better than others to train in thinking.

7. Thinking may be cultivated at any time in life, but youth and early adult life is the opportune time.

Read:

1. Dewey's Psychology, pp. 231-233.
2. Halleck's Psychology, pp. 222-238.
3. Colvin and Bagley's Human Behavior, pp. 298-324.

CHAPTER XX.

INTUITION, INSTINCT, ANIMAL INTELLIGENCE.

Nature of Intuition.—The complete knowing of an object, using the term object to mean what is in consciousness at any time—the content of consciousness, consists in grasping fully the two aspects of it, the particular and universal. By so doing the mind completely unifies it with other objects and completely distinguishes it from other objects. Only so is any object fully known.

The stages of knowing from sense-perception to imagination, inclusive, emphasize the particular, or distinguishing, aspect of content of consciousness; but the stages of knowing from conception to systematization, inclusive, emphasize the universal, or relating, aspect of consciousness. No stage up to and including systematization stresses to any thing near an equal degree both aspects of an object, the distinguishing and relating.

Two Views of Intuition.—No psychological term in common use is used more indefinitely and erroneously than this term, intuition. Popularly intuition is used to mean the process in which knowledge comes to the mind in some inexplicable way, falls down from the sky, springs up from the ground, or comes from no one knows where, nor why, a sort of inspiration, vision, or just-because kind of knowledge suddenly and accommo-

datingly appearing in consciousness. This view is the *popular* view of intuition, and its chief characteristics are its *vagueness* and *mysteriousness.*

There is another view held by a smaller number of people who have been students of the question and who have found the first view to lack any foundation in fact. This second view, which regards intuition a stage in the development of knowing in which the mind's activities may be studied and understood, may for the purpose of study be called the *special view.* Thus the two views of intuition are: 1. The *popular view.* 2. The *special view.*

The Popular View.—The popular view, as said, is vague and indefinite in the minds of most persons. It is often confused with innate ideas and instinct. But psychologists are agreed that there are no such things as innate ideas and that instinct is not knowing at all. In so far as this view has any definiteness it regards intuition as the process of *getting knowledge directly;* that is, without referring the present experience to any past experience.

Mr. Dewey says the following on this point: "Intuition is often conceived to mean a purely *immediate* act, or one taking place without the recognition of any relation of independence. * * * * Something perceived by intuition is supposed to be just what it is by virtue of its own independent existence. We are in a position to recognize that there can not possibly be intuition of such a kind. Every act of mind involves relation; it involves dependence; it involves *mediation.*"

The Special View.—According to this view, intui-

tion is the highest kind of knowing; that is, the highest stage in the development of knowing. It is the stage in the development of knowing in which the mind gets the most complete knowledge of any object and does it most easily.

As seen before there is no stage in the development of knowing from sense-perception to systematization in which the mind places equal emphasis upon both the particular and universal aspects of any object of thought. Evidently such knowing would be the highest kind of knowing for it would give the mind the most complete knowledge of any content of consciousness. Now intuition is the stage in the development of knowing in which the mind stresses somewhat equally both aspects of any object of thought, the particular and the universal. This is one of the characteristics which makes it the highest kind of knowing.

And again knowing which the mind engages in with the least difficulty obtrudes itself into consciousness least. This work of the mind is similar to almost any kind of work one does in this respect, that the easier the work is to do the less attention we give to it, as we usually say; that is, the less it obtrudes itself into consciousness. On the other hand the more difficult the work is to do the more attention we have to give to it; that is, the more it obtrudes itself into consciousness. Walking becomes so easy, playing a piano so easy, that the mind directs the activities almost unconsciously. One can repeat a verse of poetry or recite a declension in Latin almost unconsciously, so easy have these be-

come for one. But the originals in geometry the first time one works through them, and translating Caesar's bridge obtrude themselves almost painfully into one's consciousness. Work that the mind does unconsciously is done *implicitly,* and work that the mind does consciously is done *explicitly.*

Now in intuition, the highest kind of knowing, and, since the highest, the easiest kind of knowing, the mind does more work unconsciously than in any other stage of knowing; that is to say, intuition is the stage of knowing in which the mind does its work *most implicitly.* And sense-perception is the stage of knowing in which the mind does its work *most explicitly.*

From the above study the following definition of intuition is reached:

Intuition is the mind's process of most implicitly and fully grasping any object of thought in both its particular and universal aspects.

A botanist is said to know a plant more intuitively than one who is not a botanist. A mathematician is said to solve a problem more intuitively than one who is not a mathematician. A zoologist knows an animal more intuitively than one who is not a zoologist. They do, because their minds do the work so much more fully, implictly and easily than the minds of others.

Origin of the Popular View of Intuition.—It is not difficult to see how the popular view of intuition originated. People found themselves having points of knowledge which they could not account for, because the process of such knowledge was so implicit and so easy. And

in the absence of any explanation for it, it has been called *supernatural knowledge, inspired knowledge, vision, presentiment* and finally *intuitive knowledge,* or *intuition.* And from this the conclusion was reached that intuition was the process of getting knowledge from some unknown place in some inexplicable way.

As previously stated, many writers have confused intuition and instinct; for this reason and because instinct is such an important factor in all human behavior, a little study of it will be here undertaken.

The Nature of Instinct.—Man and the lower animals are constantly acting as a result of their own experience and because of tendencies they have at birth. Fundamental to an understanding of the activities of both human beings and the lower animals, is an understanding of these innate or inherited tendencies. These tendencies manifest themselves in both the obtrusive muscular and mental activities and the unobtrusive, subtler activities of feeling. These innate tendencies to act and feel are in a general way *instincts.*

"They have a profound influence on the development of both feelings and actions. All through life they serve as a background for the acquired capacities. They also color feeling and determine action when experience fails. They often conflict with the acquired and explicit knowledge where that knowledge has been fully developed."

Instincts are common to a group—a species, a genus, or even larger groups, as the instinct to save one's life in time of danger, the instinct in persons to

perform the actions necessary to take the first food, the instinct of the bird to build its nest, etc. These tendencies have been valuable to the individual and the group in its evolution for survival, and are valuable at all times for guidance when intelligence does not furnish guidance; that is, before intelligence has developed or when for any reason intelligence is in abeyance. They have proven valuable to ancestors for survival and have been transmitted to offspring as inherited tendencies to reaction, due to certain conditions of the nervous system. From the above study the following definition is reached.

Instinct is inherited tendency common to a group to feel and act in some specific way when the proper stimulus occurs.

Origin of Instinct.—In the evolution of a group individuals vary at birth greatly. No two are exactly alike. These variations may be of such a character as better to fit the individuals to live in their environment or they may be of such a character as to handicap the individuals in their struggle for existence. It is well known that the offspring inherits the congenital characteristics of the ancestors. So those who have through variation those characteristics which better fit them for survival transmit these to offspring, and these to their offspring, and so continue these as *instincts.* Those who vary in the opposite direction die before they produce offspring or transmit to their offspring the handicap which sooner or later leads to extinction. Thus instincts

are the helpful variations transmitted from ancestor to offspring until they have become fixed in the group.

Instinct has been defined as "inherited habit." But this definition is not quite accurate. It is misleading, too. Habit is acquired in one's lifetime. So habit is an acquired characteristic. And the mass of evidence is that acquired characteristics in human beings are not inherited from ancestors. Instincts are inherited congenital variations, not inherited habits.

Intuition and Instinct. — Intuition is knowing, something one acquires in a lifetime, and grows out of experience. One may intuitively know whether a certain person is friendly to some cause he is advocating, but he does not intuitively get scared at any strange noise. The baseball pitcher may intuitively know a batter's weakness, but he does not intuitively enjoy the approbation of the spectators. The wild goose instinctively migrates. The butterfly instinctively, not intuitively, lays her eggs on the plant which proves the proper food for the young. Intuition is acquired, instinct is inherited.

Classes of Instincts.—A close analysis would give many classes of instincts on different bases, but a convenient and helpful classification is as follows:

1. Individual instincts.
2. Racial instincts.
3. Social instincts.

Individual instincts are those whose tendency is to contribute to the welfare of the individual. Examples of individual instincts are: 1. The instinct which guides

the child in taking his first food. 2. The instinct of self-protection. 3. The child's fears. 4. The instinct of pugnacity. 5. The instinct of ownership, and many others.

Racial instincts are those whose tendency is to continue the existence of the species. Examples of racial instincts are: 1. The egglaying instinct of animals. 2. The nest building instinct. 3. The mating instinct of human beings and animals. "The innocent adolescent youth is as surprised at his thrills as he gazes upon the beautiful object of his first love and may be as ignorant of their cause and purpose as is the beetle that is laying its eggs, or the robin that is building its first nest." 4. The instinct of jealousy. 5. The parental instinct, and many others.

The social instincts are those whose tendency is to preserve the social group. Examples of the social instinct are: 1. The desire for companionship. 2. Bashfulness in the presence of strangers. 3. The instinct of sympathy. 4. The instinct of self-sacrifice.

Value of Instincts.—Instincts influence directly or indirectly all the activities of man. They form the basis for all sorts of activity which we commonly think of as learned, intentional, purposive and reflective. Man has the most instincts of any being. This is different, however, from saying that the largest proportion of his acts are instinctive. Man modifies, controls, changes and inhibits his instinctive action largely, animals lower than man much less. The following is a good summary on instinct from Mr. Pillsbury: "In summary it may be

said that instincts are movements, or feelings that may or may not be the result of movements that come because of inherited connections and dispositions in the nervous system. In function they serve, on the one hand, to keep the infant alive until he may be able to learn for himself, on the other they serve to enforce general lines of conduct that are essential for the preservation of the individual, the race and the social group. As opposed to habits and rational activities, instincts, of the latter class at least, are vague and prescribe only the end to be attained, not the precise means. Even the first group of instincts to make its appearance is soon modified by habit, or is repressed. Instincts can not be set apart from habits and other intelligent movements in the adult; all that can be said is that these acts have an instinctive element or an instinctive basis, the others are altogether acquired. The advantages of an inheritance of the vague outlines of action only with much left to individual learning is evident, if one will but consider the relatively small number of movements that may be inherited and the great number of situations to be met, not to mention the great possibility of change in the environment. Were an organism to be rigidly limited to a few forms of response to predetermined conditions, it would soon find a situation for which it was not prepared and be eliminated. Or if the environment should change in some way, the organism could not long survive."

Animal Intelligence.—Closely connected with intuition and instinct is the question of animal intelligence.

Intelligence, it will be remembered is something acquired in the life of the individual. It is acquirement of the being which he obtains by learning. If an animal acts by instinct, but learns a better way of responding to a stimulus than that prompted by instinct, he has gained some knowledge and has some intelligence. There could be thousands of illustrations given to show that animals do this very thing. But since there is no one, so far as the writer knows, who has studied this subject long enough to make his opinion worth anything who denies intelligence to animals lower than man, this phase of the question needs no further study.

Another aspect of this subject is, Do animals lower than man reason? This is yet an unsettled question. People are divided into about three classes on the basis of their views on this question. There are those who are perfectly certain that animals lower than man can reason. There are those who are just as certain that animals lower than man can not reason. And there are those who yet have to be convinced which view is right. And it is interesting to know that some of those who have studied the question most carefully belong to the last class.

And again, much of this difference of opinion hinges on the meaning to be put in the term reasoning. Wundt says animals lower than man do not reason and most men do not. If a definition of reasoning could be agreed upon, much of this difference of opinion would vanish. But so long as different persons mean different things by reasoning the dispute will go on.

If one adopts the definition for reasoning that *it is the mind's process of explicitly comparing two ideas through the medium of a third,* it is safe to say that no one as yet has proved that the lower animals reason; and it is equally true that no one has proved that they do not. But if reasoning be defined as *the mind's process of adapting means to end,* then there are abundant instances of reasoning among the lower animals.

A study of the minds of elephants, of apes, of horses, of dogs, etc., makes it very difficult for one not to believe that these animals possess all the mental faculties that man possesses only in a smaller degree.

"Meantime, we have to remember that the nervous system of the higher animals seems to afford all the necessary basis for the appearance and development of the simpler forms of rational consciousness, and the only difference in these processes, as compared with those of man, of which we can speak dogmatically and with entire confidence is the difference in complexity and elaboration."

Distinguishing Element of Intuition.—In intuition the mind deals with both aspects of an object of consciousness, the particular and the universal. And the attitude of the mind toward the object is such as to regard these aspects of equal worth. In no other stage of knowing does the mind do this. The distinguishing element of intuition is as follows:

The mind regards the particular and universal aspects of objects with equal stress.

The Advance of Intuition.—The advances of intuition over the other stages of knowing are:

1. *The mind in intuition knows objects most completely;* that is, *most fully in both aspects.*

2. *The mind knows objects most easily.*

3. *The mind knows objects most implicitly.*

This knowing an object most easily, most implicitly with both the particular and universal aspects of the object stressed is the highest kind of knowing possible and with it the development of knowing ends.

Read:

1. Angell's Psychology, pp. 294-309, 251-255.
2. Dewey's Psychology, pp. 235-245.
3. Pillsbury's Essentials of Psychology, pp. 238-257.
4. Colvin and Bagley's Human Behavior, pp. 126-164.

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